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The Slattery Electric Meter.

We illustrate in the Review this week the Slattery meter, manufactured by the Fort Wayne Electric Company, for which a much wider range is claimed than has been attained by other forms. The readings are direct, in lamp-hours or ampere-hours as desired, and are almost absolutely proportional throughout the whole range of the instrument.

The general principle of this motor-meter is the combination of two angularly disposed coils carrying primary and secondary alternating currents, the field of force resulting from the lag of phase as between the two coils, with a movable portion or armature consisting of a very light cylinder of copper. The small amount of inertia possessed by this cylinder permits it to start with a load as low as one 50-watt lamp. The secondary coil is naturally of low resistance, and one form is very quickly and conveniently made by nearly dividing a polygonal shell of copper by saw cuts into parallel sections, leaving, however, a midrib to support the sections. By this means coolness, and the prevention of eddy currents, are obtained. The loss of energy in this meter is so small as to be practically negligible, an important element in a large installation. The sensitiveness of the meter may be increased by the addition to the copper cylinder of very light iron discs attached to its periphery in planes normal to the axis, as shown in the cut, though these are not essential. These meters are now being made and shipped in large quantities.

An ingenious method is adopted to make the rotation proportional to the current. In electric motors in general, the speed of rotation increases practically as the square of the current. For meter work retarding vanes are often adopted to reduce the speed for convenience of registering, but the atmospheric resistance of such vanes does not follow the same law as above, since the retarding effect becomes more and more disproportionately great as the speed rises. In the Slattery meter, however, the vanes are constructed with jack-knife blades, which close on the vanes as the speed increases, thus reducing the exposed surface, and allowing the speed to increase to the proper extent. The relations are such that the rate of increase of speed exactly accords with that of the current, and great accuracy is thus attained.

In our illustrations Fig. 1 is a general view of the complete meter, with its cover removed, the latter being shown in Fig. 2; Fig. 3 is a general view of all the component parts of the meter ready for assembling, and Fig. 4 is a simple outline elevation showing the arrangement of the vanes for automatic adjustment of their exposed surface. As the speed rises the centrifugal force causes the pivoted outer blades to swing back and overlap the inner blades, thus reducing the surface.

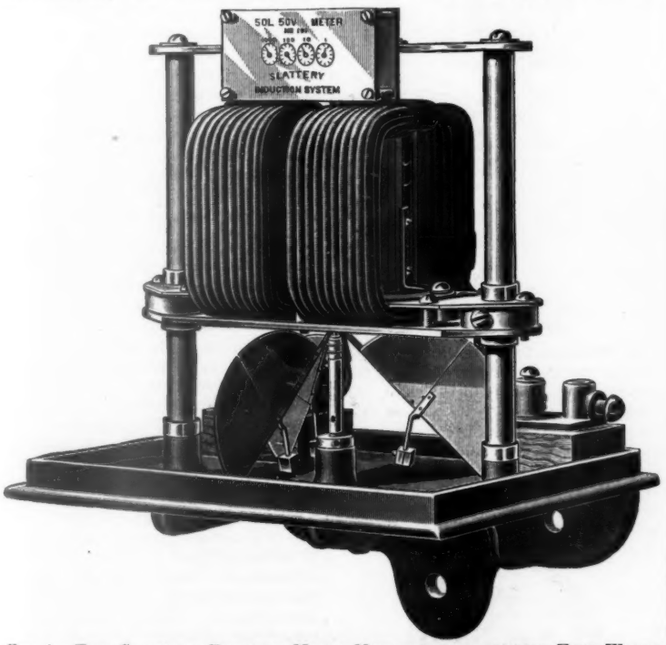


Fig. 1.—The Slattery Electric Meter Manufactured by the Fort Wayne Electric Company.

Fig. 2.—Cover of the Slattery Electric Meter.—(See page 2.)

The Electrical Accumulator Company, in availing itself of the decision of Judge Coxe sustaining the Faure patents, recently filed bills in Equity against Henry B. Thayer and the Western Electric Company of New York, who had been using a secondary battery made by the Woodward Electric Company of Detroit, commonly known as the "Detroit Battery." A preliminary injunction was asked for and granted by Judge Lacombe on October 4th. The same complainant about the same time filed bills in Equity against the Citizens' Electric Illuminating Company of Brooklyn, who were using a battery made by the Mutual Electric Manufacturing Company of Brooklyn, alleging infringement of patents of Faure and a key-lock patent of Sellon. The preliminary injunction asked for in this case was also granted by Judge Lacombe.

The Incandescent Lamp Suit Against Edison Dismissed.

A decision was rendered in the Westinghouse *versus* Edison suit last Saturday, Justice Bradley dismissing the suit. This suit was brought in the U. S. Circuit Court at Pittsburgh, the Consolidated Electric Light Company, which owns the Sawyer-Man patents, and which in turn is owned by the Westinghouse Electric Company, bringing the suit against a local Edison Company at McKeesport, Pa. The claim was made that Edison infringed a patent of Sawyer and Man. Some extracts from the decision were telegraphed as follows:

"We are not satisfied that Sawyer and Man ever made and reduced to practical operation any such invention as is set forth in the patent in suit. The evidence as to what they did up to 1879 is so contradictory and suspicious we can with difficulty agree to the conclusion sought to be drawn from it. We are not satisfied that they ever produced an electric lamp with a burner of carbon made from fibrous material, or any material, which was a success. During 1878 and 1879 they obtained 19 electric lamp patents, and not one of them contains a hint of such an invention as that contained in the patent in suit, which was not applied for until 1880. The application for the patent in suit was not made until a year after their experiments ceased and after the inventions of Edison had been published to the world.

"Suppose they did construct a lamp with burners of fibrous material which continued to give light for days, or weeks or months—were they a successful invention? Would any one purchase them now? Did they not lack an essential ingredient, and did they go any further in principle, if they did in degree, than lamps constructed before? It seems to us that they were following a wrong principle. The great discovery in the art was that of adopting high resistance in the conductor, with a small illuminating surface and a corresponding diminution in the strength of the current. This was done by Edison with filamental conductors in a vacuum within a globe made of one piece of glass. This discovery made electric lighting practical in houses and cities. This discovery is traced in growth in both the Edison patents.

"What was the object of all the experiments made by Sawyer and Man and others? Was it not to make an electric lamp that could be successfully used by the public and have a commercial value? Did they succeed in making such a lamp, or in finding out the principle on which it could be made? We do not so read the evidence. The bill must be dismissed."

Mr. Westinghouse in an interview is reported as follows:

"This decision leaves the Westinghouse Company just where it was before, and cannot under any circumstances affect it adversely, although, of course, we would have much preferred a different result. We have strong hopes of obtaining a favorable decision from the Supreme Court on appeal, but whatever happens, our company will still be able to manufacture and sell incandescent electric lamps as freely as it did before, and our customers can continue to purchase them of us with perfect safety. The worst that can happen is that the incandescent lamp shall be finally declared public property, as is already the case with the arc lamp. It should be remembered that this decision affects only one of our many patents. We own several others covering essential details in the manufacture of incandescent lamps, which we feel confident of sustaining, and which all users and makers of lamps not licensed by us must infringe. While this decision is against us, it is not in favor of Mr. Edison or his patents. The business and profits of the Westinghouse Electric Company will not be adversely affected by this decision.

Mr. Edison, who returned from Paris on Sunday, was of course greatly pleased over the decision. He said:

"When I went to Pittsburgh and saw what an intelligent old man Justice Bradley was I went to Europe in perfect security. I have 150 suits against Westinghouse and there must be a settlement soon. The Supreme Court, I am confident, will affirm Justice Bradley's decision."

Elihu Thomson's Induction Experiments at the Paris Exhibition.

Our contemporary *The Telephone*, London, says: The action of currents upon other currents was discovered by Ampère in 1820, a short time after the fundamental experiment of 'Oerstedt. The famous French philosopher has summed up all the principles in an approved law, which bears his name and which enables one to foretell the nature of the action, and the importance of that effect for two currents of whatever form, and also the effect of a current upon itself. Ampère, however, for some reason did not give attention to one of the most interesting cases, that of the action of two currents in which the second is induced by the first. Previous to the time of his researches the existence of induction was not understood. Even after the discovery by Faraday in 1830, the question was allowed to remain entirely uninvestigated, and the particular effects were studied for the first time, in 1884, by Prof. Elihu Thomson, who called attention to them before the American Institute of Electrical Engineers. Since that time he has studied them, developed them, and succeeded, by means of alternating current machines, which are so largely used to-day, in performing a number of the most interesting experiments which excite the admiration of experts and the astonishment of the numerous visitors who resort to the gallery of liberal arts at the International Exhibition at Paris. Mons. Hospitalier thus explains these experiments.

"Let us examine, in the first place, the general principle upon which these experiments are based. When a core of iron is surrounded by a coil, traversed by an alternating current, it becomes magnetized periodically, first with one polarity and then with the other. This produces a flow of magnetic force which, starting from zero, increases, reaches a maximum, decreases, falls to nothing, changes its sign, and passes again through the same phases, but in an opposite direction.

"With a suitable alternating current machine these alternate forces change their sign very rapidly, as often as two or three hundred times per second.

"If we now place above the iron core a copper ring in a plane parallel to the lines of magnetic force, the variable flow traverses this ring, inducing intensely strong currents, and these currents develop, so that if we hold the ring in place for some minutes the effect is to raise the temperature of the ring until it cannot be held by the hand. Lenz's law tell us that the induced currents will be of such a sign at any instant that they oppose the variations of the force proposed by the primary coil or its inductor. Reduced to this simple phenomenon, the induced current will lag behind the inducing one a quarter of a period, and with these conditions the sum of the attractions will be exactly equal to the sum of the repulsions; there will be no attractive or repulsive action between the two circuits on account of this uniformity. In fact, is it not thus that the current induced in the secondary opposes itself as soon as it is set up, by reason of the phenomenon known as self-induction? The resulting induced current is retarded or delayed a certain fraction of a period, and uniformity no longer exists. The sum of the attractions is then less than the sum of the repulsions; the repulsion predominating is sufficient to hold the ring suspended in space against the force of gravity. This repulsion is so strong that it is impossible to lay the ring or disc of copper on the magnet core, or rather on the case in which the core is concealed, and leave it by itself. It is really marvellous to see flying off at a tangent all these objects placed on the table, which persistently refuse to remain there when left to themselves. This experiment can be made in a different form; on slipping a ring of copper over the magnetic core, excited by an alternating current, nearly as far as the middle point of its vertical length, this ring, if left to itself, leaps up vertically and raises itself as far as 40 centimeters above the magnet core. These experiments deal only with electro-dynamic repulsions; we can complicate the phenomena, and produce very peculiar rotations by creating an unsymmetrical field. To effect this we place upon the magnet core a half disc of copper, which covers exactly half of it. The induced currents in this disc act as perfect magnetic screens, almost completely preventing all flow of lines of force in the region above it. If we place near the magnet core, in the region where the periodic magnetic field has been partially suppressed, a copper disc, mounted on a pivot, this disc

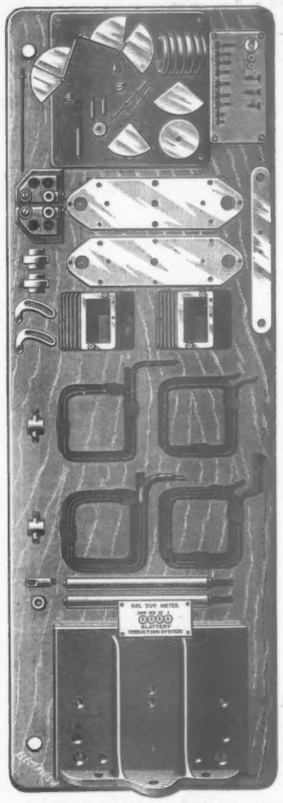


FIG. 3.—THE SLATTERY METER.—VIEW OF ALL THE PARTS.

is repulsed in the region where the flow is strongest. It dips and revolves rapidly around its vertical axis.

"The same phenomenon of rotation is also produced by an inductive apparatus having a much smaller core placed under one-half of the disc, care being taken to so place a screen that one of the sides is placed radially to produce an unsymmetrical field. The direction of rotation is toward the screen. We may also obtain rotations and repulsions by means of a hollow copper ball placed inside a glass vessel filled with a certain quantity of water. The ball is repelled, and at the same time exhibits a movement of rapid rotation, which is quite inexplicable to those who are not conversant with the phenomena of induction that cause it.

"The same copper ball placed on a pedestal, the half disc screen being, of course, concealed in the cover, performs on this platform various movements, rolling, stopping, changing its position, etc., the differences depending on the relative positions of the screen, of the core, of the ball, and of plane on which it moves. We can also make the ball revolve in one place, and upon its own axis, by placing it on a rectangle of copper forming a screen on which is a depression or hollow of spherical form, in which the lower part of the ball rests, so placed that the repulsions are not strong enough to force it out.

"A last experiment—and it is no less remarkable—demonstrates the phenomena of repulsion and induction in a striking manner.

"The ring is replaced by a small, round coil of insulated wire, the ends of which are connected to an incandescent lamp. The whole is then put into a vessel filled with water placed above an induction apparatus. When the alternating current is sent through this induction apparatus, the lamps lights up, as long as it is under the influence of the electro-dynamic repulsions, and tends to rise to the surface, stopping at an intermediate position, so that the repulsion and hydrostatic pressure balance the weight of the lamp and the coil. This lamp, burning under water without any connection whatever, is one of the most beautiful and striking experiments one can imagine or employ to show the induction phenomena at a distance, and the possibility of their transmission through a variety of media."

The Electric Light in Burmah.

Major E. C. Browne, an Englishman, writing about the acquisition of Burmah by the British, describes the effect upon the natives of the first exhibition of the electric light. "A great ray of soft light," he says, "shoots across the heavens from horizon to horizon. A flood of light is cast on a spot in the village, but it is off with more than lightning rapidity to illuminate another. The village is illumined. It visits every portion of it and seems to enter at the doors and windows. At first the people rush away, but finding that in many cases the light follows they throw themselves down with their faces to the earth. In a few minutes the village and river banks are cleared, and the terrified people take refuge in the bush or at the backs of the houses.

"But this only lasts a very short time. Curiosity is stronger than prudence. So far the light has struck no one dead. Perhaps it may be harmless, so the children, clinging to each other, venture into the glare, then run to their mothers' arms screaming half with fear and half with delight. Some of the big boys then rush out, have a good stare, and having dared so much once more disappear. The ladies seem to gain confidence next to the children. Their curiosity cannot be restrained any longer, so they get together in groups and hide their faces, and scream and giggle. Some of the more cheeky ones actually put out their tongues at us and begin dancing and gyrating about. The men, last of all, moodily emerge from their cover, and still, not half liking it, walk cautiously about, and gradually the village is gay."

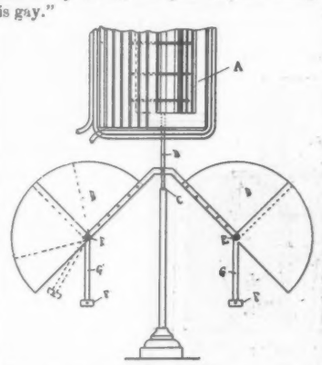


FIG. 4.—THE SLATTERY METER.—OUTLINE OF VANES.

San Francisco, Cal.—Articles of incorporation of the Pacific Power Company have been filed in the County Clerk's office. The company is organized for the purpose of establishing electrical and other power plants in this city; directors, John J. Haley, J. Wm. Lucas, J. J. Clarke, E. T. Steen, Wm. H. Birch, F. A. Huntington and E. C. K. Royce; capital stock, $5,000,000, divided into 500,000 shares.

FIG. 5.—REDUCED CUT OF SLATTERY METER, WITH GLASS GLOBE.

Salem, Ore.—The Columbia and Nehalem Railroad Co.; to operate a railroad and telegraph line from a point near the mouth of Milton Creek, Columbia county, to a point near the mouth of Oak Ranch Creek; principal place of business, Portland; capital stock, $250 000; James Markle, Jr., E. J. Jeffery, J. C. Carson, A. Kinney, C. Rockwell, D. C. McKercher, H. Alger and F. A. Moore, incorporators.

Chicago, Ill.—Southwestern Telegraph Company; to construct and operate telegraph lines in Illinois and other States; capital, $50,000; incorporators, W. O. Hall, F. P. Meynberg, J. Howland, Slivera and Y. C. Spencer.

Detroit, Mich.—The Short Electrical Railway Company has filed articles of association with the county clerk. Its capital stock is $1,000,000, with $500,000 paid in. The incorporators are Sidney H. Short, N. B. Abbott, Chas. J. Tracy, George W. Stockley, Charles F. Brush, Wells W. Leggett, and J. Potter, of the Brush Light Company, Cleveland. The object of the company is to manufacture and sell supplies for electrical railways.

Mansfield, Mass.—Three new electric light companies have been incorporated respectively in Mansfield, Braintree and Foxborough. William A. Stiles is president, and Henry N. Bates, and these, with Melville P. Morrell, constitute a majority of the board of directors. These companies are supposed to be factors in behalf of the Westinghouse in the contest which is going on between that company and the Thomson-Houston people.

New York City.—The Phœnix Electric Light and Power Company, for supplying electricity for light, heat and power purposes in the cities of New York and Brooklyn and other places in the United States, filed articles of incorporation with the Secretary of State at Albany. The capital is $500,000. The incorporators are George P. Valentine, C. W. Platt, E. L. Johnson, and James B. Lathrop, of New York, and James W. Purdy, Jr., of Brooklyn.

Pittsburgh, Pa.—A charter was granted to the Maple Creek Telephone and Telegraph Company; capital, $3,000. The company will operate lines from Pittsburgh through lower St. Clair, Baldwin, Jefferson and Snowden townships, in Allegheny county, and through Union, Carroll, Fallowfield, Nottingham, Somerset and Pike Run townships, in Washington county. The shareholders are as follows: James B. Oliver, Geo. T. Oliver, John Phillips, David B. Oliver, Raphael Sargent and Horace Crosby.

Camden, N. J.—Articles of incorporation were filed in the office of the Camden county clerk by the Haddonfield Electric Light and Power Company. The capital stock is $25,000, with $1,000 paid in. The objects of the company are to construct, maintain and operate works for the manufacture, supply and distribution of electricity. The incorporators are Frederick Sutton, Americus R. Underdown, Walter E. Hunt, Bowman H. Shivers, John R. Stevenson, Nathan Lippincott, John H. Bell, Samuel Dunbar, Wm. C. Jones and Charles H. Mann.

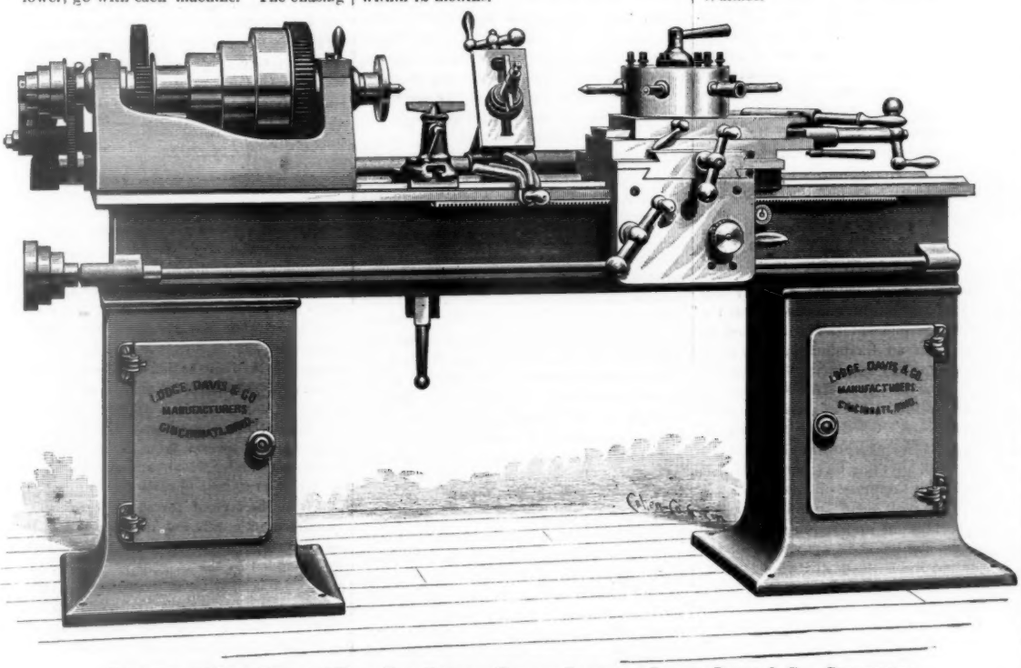
Spokane Falls, Wash.—Chester Glass, George E. Adams, Patrick D. Byrne, W. H. McFarlan and Frank D. Stanley filed articles of incorporation in the auditor's office for the organization of the New York Investment Company. The capital stock of the corporation is $200,000. The object of the corporation is to construct and operate street railways to be operated by cable, electricity, steam or horse-power; to construct necessary works to furnish and operate light or power by electricity or gas, and to construct and operate telegraph and telephone lines in Spokane Falls and throughout Spokane country.

Detroit, Mich.—Articles of association of the Detroit Electric Light and Power Company, which will operate the patents of the Jenney Electric Light Company, of Fort Wayne, Ind., were filed recently. The company has a capital stock of $300,000. The stockholders are R. T. McMonald, of Fort Wayne, representing the parent company; F. F. Palms, W. P. Ratigan, A. Michenfelder, R. T. McDonald and A. L. Dudley, Joseph B. Moore, George M. Vail, Gilbert W. Lee and G. H. Hammond, Jr., W. B. Moran, trustee; Andrew Hair, George E. Fisher and W. P. Fitzgerald. The company will furnish lighting by the arc and incandescent systems.

Improved Lathe.

The machine illustrated in the REVIEW, this issue, represents an 18-inch by 6-foot Cabinet Fox Monitor, manufactured by Lodge & Davis Machine Tool Company, of Cincinnati, Ohio, and is designed chiefly for brass workers, and has found popular favor in electrical factories. Our practical readers will be interested in the following description: The spindle is driven by a four grade cone pulley, the largest diameter is 10 inches for a 2½ inch belt, and is back geared 9½ to 1. The front bearing of spindle is $2\frac{7}{16}$ inches diameter by 4¾ inches long. The boxes are of the best phosphor bronze, the end of spindle is threaded to receive face plate or chuck, and has taper hole for center, and with the center in the turret, and hand rest accompanying, machine may be used as a hand lathe. The thread chasing bar is very stiff, being $2\frac{7}{16}$ inches diameter, and has substantial bearings bolted to back of bed; the front bearing of chasing bar can be moved along the bed to accommodate position of chasing head when operating on work held in chuck or on centers. The pitch of the thread is obtained by a leader geared two to one into spindle at rear end of head, the leader engaging with a follower on chasing bar, one leader and follower to cut 11½ threads per inch, also one hob to cut follower, go with each machine. The chasing die having an automatic engine feed, with three changes, driven by 1-inch belt, and reverse from right to left by a lever in the apron.

The makers of the machine guarantee the workmanship and material to be strictly first-class, and equal to any in market. Its weight is 2,200 pounds.



IMPROVED 18-INCH SWING, 6-FOOT BED CABINET TURRET LATHE OF LODGE, DAVIS & CO., CINCINNATI.

device has a tilting handle, by which the operator can back the arm to under side of bed, and prevent its lifting when in use, but allows it to slide freely endwise; straight or taper threads may be cut.

The turret on tool head is nine inches diameter, and has six steel bushed holes for the reception of tools; it also has hardened steel index bushings for taper end of index lock pin. The slide upon which turret rests has a longitudinal movement of six inches, and can be instantly changed from a lever to screw feed. This top slide rests upon a slide having a right angle hand movement, operated by a screw to front of machine of 6⅝ inches, allowing a piece 13¼ inches diameter held in chuck, to be faced off by tools in turret.

When using this hand set over, the holes in turret can always be brought central with spindle by a positive stop. The stop can be quickly removed when tools are to be used on back side of center of spindle. The slide has an additional cross movement operated by a supplementary taper slide, taper being derived from a bar between the ways of the bed; the bar can be set by a graduated index to obtain any taper up to four inches to one foot. When used for straight work, the taper slide is locked to saddle by a taper tool steel pin, having a square head for its ready removal. The taper slide rests upon a sad-

Chicago, Ills.—The Secretary State of has issued a license to incorporate the Electric Street Railway Company at Chicago; capital stock, $200,000; to build and operate street railways. Incorporators, Edward Blix, William Kron and W. A. Paulsen.

Boston.—Under the general corporation law the Braintree Electric Company, the Mansfield Electric Company and the Foxboro Electric Company have been chartered, each with a capital of $10,000, Wilber A. Stiles being president and Henry N. Bates treasurer of each.

Waukesha, Wis.—The Waukesha village board adopted a resolution favoring the granting of a franchise for an electric street railway, and an ordinance will be presented at a meeting of the board, to be held the 17th, to further the enterprise. Fitch and Jarvis are the petitioners for the franchise, and they propose to construct three and a half miles of road and have it in operation within 12 months.

Morris, Ill.—Morris Electric Light Company, at Morris; capital stock, $5,000; incorporators, Lewis Degen, Charles H. Kusel and H. L. Miller.

Haddonfield, N. J.—The board of directors of the Haddonfield Electric Light and Power Company has elected the following officers: President, Charles H. Mann; vice-president, A. R. Underdown; treasurer, Frederick Sutton; secretary, W. C. Jones. The stock, $5,000, has all been subscribed for, and the location for the plant has been purchased.

Camden, N. J.—Articles of incorporation were filed in the office of the Camden county clerk by the McLaughlin Electric Company. The capital stock is $300,000, with $2,000 paid in. The incorporators are Joshua Pfeiffer, Robert B. Esler, Jr., of Philadelphia, and William J. Coite, of Haddonfield. The objects of the company are to manufacture, generate, sell and rent electrical power.

Omaha, Neb—The Blair Street Railway Company has filed articles of incorporation. Existence dates from September 1, 1889, and terminates September 1, 1950. Its purpose is to construct, maintain and operate street railways with horse, electric or motor power. Authorized capital stock, $100,000; incorporators, Jesse T. Davis, Edgar A. Stewart, Perry Selden, J. R. Conkling and W. W. Wallace.

Washington, Pa.—James, George T. and David B. Oliver, Raphael Sargent, Horace Crosby and John Phillips, on September 11 will make application for a charter for incorporation to be called the Maple Creek Telephone and Telegraph Company, the object of which is to maintain and operate telephone and telegraph lines between Pittsburgh and Fallowfield, Washington county.

Omaha, Neb.—Articles incorporating the South Sioux City Electric Motor Railway Company are filed with the Secretary of State. The object of the company is to build, equip and operate a street railway system. For this purpose a capital stock of $200,000 has been authorized and subscribed. Incorporators, R. M. Bowler, Frank Hunt, J. M. Moan, William Luther, Atler Heart and E. C. Palmer.

Boston, Mass.—Charters have been granted the Ayer Electric Company, B. H. Hartwell, president; T. T. Robinson, treasurer; capital, $5,000; the Acton Electric Company, J. R. Bullard, president; T. T. Robinson, treasurer; capital, $10,000; the Needham Electric Company, J. R. Bullard, president; T. T. Robinson, treasurer; capital, $10,000; the Blackstone Electric Company, J. R. Bullard, president; T. T. Robinson, treasurer; capital, $10,000.

Chicago, Ill.—The Enterprise Electric Light Company; location Chicago; to operate an electric light plant; capital stock, $100,000; incorporators, Melville T. Roberts, Kenneth F. Griffiths and Alexis C. Burdick.

Baltimore, Md.—The National Electric Motor and Manufacturing Company, of Baltimore, was incorporated; capital stock, $250,000. The incorporators are Robert E. Diffenderfer, Joseph R. Simpson, William C. Amos, William G. White and Geo. W. Walther. The object is to furnish motive power, etc.

San Francisco, Cal.—The Pacific Bell Telephone Company has reorganized under the name of the Pacific Telephone and Telegraph Company. The new company's capital amounts to $5,000,000. The stock, franchises, lines, general rights, etc., of the Pacific Bell Telephone Company will be purchased by the new company, whose stock will be issued in payment for old stock. This combination will include a controlling interest of the Sunset Telephone Company, now sub-licensees of the Pacific Bell Telephone Company and their general business medium outside of San Francisco. It is the intention of the reorganized company to enter into a wider field of operation. The directors are Lloyd Tevis, John J. Sabin, W. F. Goad, E. S. Pillsbury, W. C. Gibbs, Joseph N. Quay and John E. Hudson.

New Bedford, Mass.—The Edison Electric Illuminating Company will increase their capital stock from $100,000 to $150,000.

Grafton, Mass—The Grafton and Upton Electric Company, of Grafton and Upton, has been granted a charter with a capital of $20,000.

Bridgewater, Mass.—The Bridgewater Electric Light Company has been incorporated with a capital of $15,000. Mr. F. A. Wyman, Boston, is president, and A. S. Palfrey, treasurer.

Boston, Mass.—The Uxbridge and Northbridge Electric Company, capital, $20,000, and Randolph & Holbrook Electric Company, capital, $15,000; Ferdinand A. Wyman president, and Arthur S. Palfrey treasurer.

Madison, Wis.—The Kaukauna Electric Light Company has filed articles of association with the Secretary of State; capital stock, $30,000; incorporators, William H. Earles, Charles Kirchhoff, Jr., and Henry Junge.

Shelbyville, Ill.—The Illinois Water and Light Company, of Shelbyville; to erect water and light plants in Shelbyville, Mattoon and Belleville; capital, $300,000. Incorporators, J. W. Lloyd, William F. Thornton and Henry C. Robertson.

Albany, N. Y.—The Manhattan Electrical Supply Company is formed by Harry T. Johnson, John J. Gorman and Patrick E. Kane, for the manufacture and sale of electrical apparatus, machines and supplies in New York; capital, $10,000.

St. Louis, Mo.—The City Electric Light and Power Company, of East St. Louis, have filed articles of incorporation with the County Recorder. The incorporators are Henry D. Sexton, Steve Sexton, Anthony Isch, with a capital of $25,000.

Alexandria, Va.—The Richter Electric Construction Company has been incorporated with a capital stock of $1,000 000. Chas. Richter, of Camden, N. J., is president; H. L. White, of Somerville, Mass., treasurer, and A. G. Gray, of Brooklyn, N. Y., secretary.

New York City.—Stanley Y. Southard, Clarence M. Griswold and Charles M. Van Heusen filed at Albany articles incorporating the Crosby Electric Company, for developing, manufacturing and selling electric and other appliances in New York City and Boston. Capital, $100,000.

Chicago, Ill.—Chicago and Western Railway Company, Chicago; to operate street railways in the suburbs of Chicago; capital, $150,000; incorporators, John Morton, W. J. Haller, Edmund Bailey, Richard H. Dakin and E. U. Fleishmann. Electricity will probably be the motive power.

Madison, Wis.—The Kaukauna Electric Light Company has filed articles of association with the Secretary of State; capital stock, $30,000; incorporators, William H. Earles, Charles Kirchhoff, Jr., and Henry Junge. The Milwaukee Investment Association has filed articles of dissolution.

Pittsburgh, Pa.—The Equitable Electric Railway Construction Company, a corporation which will apply for a charter on October 9. Messrs. William Stern, Isaac H. Silverman, Philip Silverman, George D. Levy, A. H. Chadbourne, William Hazelton and W. A. Stadelman are the incorporators.

Springfield, Ill.—Articles of incorporation have been filed for the Southwestern Telegraph Company of Chicago. Its object is to construct and operate telegraph lines in Illinois and other States. Capital stock, $50,000; incorporators, W. O. Hall, F. P. Meyenberg, J. Howland Silver and Y. C. Spencer.

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EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, OCT. 12, 1889.

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Lieut. Bradley A. Fiske, U. S. N., will deliver an address before the Franklin Institute, January 20, 1890, on "Electricity in Warfare." Other lectures of interest to electrical workers will be one by Dr. Louis Duncan, entitled "Modern Conception of Electricity," one by Capt. Eugene Griffin on "Electric Railways," and one by R. W. Pope on "Electricity, its Past, Present and Future."

Professor Sylvanus Thompson has pointed out that sparking may be very materially lessened, if not entirely obviated, upon opening the circuit of an electro-magnet, if the core is surrounded by a heavy shield of copper. Although such a device would slightly decrease the efficiency of such magnets, this might be compensated for by the increased safety in handling the apparatus. Any one who has ever opened the circuit of an electro-magnet of considerable size and permitted the current to pass from hand to hand, would appreciate any device which would prevent the momentary rise of potential.

The American Street Railway Association will meet in Minneapolis October 16 and 17. Mr. Geo. B. Kerper, of Cincinnati, Ohio, is president, and Wm. J. Richardson, of Brooklyn, secretary and treasurer. There will be a committee report and discussion on the use of electricity on street car lines.

The Slattery meter, described elsewhere, is an apt illustration of the value of simplicity in designing. A highly important result is accomplished in a manner which compels admiration. In devices of this character it may be said that poverty of complication always betokens wealth of merit and reliability.

It is said a new law partnership has just been formed between Hon. Benjamin Butterworth, Benton J. Hall and Frank T. Brown. Each of the two first named was formerly Commissioner of Patents, while Mr. Brown has been for a long time principal examiner in the divisions of arc lighting, electric signaling, telegraphy and telephony. We hear the new firm start under especially happy auspices. They have our best wishes.

The famous incandescent lamp suit was decided on Saturday, the opinion having been handed down by Justice Bradley of the Supreme Court, during a session of the U. S. Circuit Court at Pittsburgh. The full text of the decision has not reached us. From our telegraphic extracts of the decision, however, it would seem that the patent sued upon, *i. e.*, the Sawyer-Man patent for fibrous carbon filaments, has been declared invalid on the ground that Sawyer and Man were not the original and first inventors of the improvement. The opinions of several of the interested parties are published in another column.

THE PAY OF PATENT OFFICE EXAMINERS.

Commissioner of Patents Mitchell has struck the keynote in reflecting upon the wretchedly insufficient salary attached to the position of an Examiner in the Patent Office. The salary is practically no higher to-day than it was a quarter of a century ago; while the fields of invention have spread over such a bewildering area that he must truly be an exceptional man who can survey it with anything like familiarity. It is a shame that Congress will not act in this matter. The position of an Examiner is a most important one and requires men with exceptional ability, great knowledge of the sciences and industries of the whole world, tenacious memory, and a host of other qualifications which make the services of their possessor far more valuable to firms and corporations outside the Patent Office. The result is, and must be, frequent resignations from a service that really should be a life-tenure. It is an injustice to the whole community of inventors whose work has done so much for this favored country, and Congress ought in all fairness take such measures as will insure the retention of such men in their positions.

THE UNITED STATES SIGNAL SERVICE.

On the 1st October a number of transfers of officers of the signal service were made. The military telegraph lines in Massachusetts, Rhode Island, Virginia, North Carolina and Florida, are placed in charge of Lieut. John P. Finley who is stationed at Boston, and the office at Woods Holl, Mass., heretofore in charge of Lieut. Wright, is closed. The lines in Montana, Dakota, Wyoming and Utah are in charge of Lieut. John C. Walshe, at St. Paul, Minn.; those in Arizona in charge of Lieut. Greene at Prescott, while the lines on the Pacific coast are under the management of Lieut. Jas. A. Swift, whose headquarters are at Ashland, Ore.

Professor Cleveland Abbe, the chief meteorologist of the signal office, will sail this week with the government expedition which goes out to observe the total eclipse of the sun on the west cost of Africa on the 22d of December. His special object is to study the air currents at sea. The expedition will be out about six months and the entire time will be devoted to scientific research in many directions, including investigations in atmospheric electrical phenomena. The naval cruiser "Pensacola," which takes out the expedition, is well fitted with electric apparatus.

ELECTRICITY AS A RAILWAY SAFEGUARD.

In our editorial comment last week on the application of the electric telegraph to securing safety to railway trains, we called attention to the well known block system now in regular use on some of our railways and on many in Europe. Continuing on the subject of safe-guards, there is also another system which is even more direct and flexible which is now and has for a long time been in use on the Lehigh Valley R. R. We allude to the system known as the Induction Railway Telegraph, devised by Messrs. Edison, Smith, Gilliland and Phelps. In this an unbroken line extends along near the railway, and by inductive influence is made the means of direct communication with every train on the line whether in motion or stationary. Instruments are on the baggage car and an operator in attendance.

The device works well, and a complete system of instant communication between any two trains or any train and the train dispatcher is thus at hand. It matters not that the train to be signaled is running at a rate of 60 miles an hour, it is as easy as if it were standing.

Undoubtedly, the use of this system would have prevented the recent accident on the New York Central Railroad. When the leading train was obliged to slow up its speed, it could have telegraphed with the greatest ease to the train behind, which also would have then slowed up, neither train coming to a dead stop until it became necessary.

But the induction system like the block system cannot be installed for nothing.

THE ELECTRICAL INDUSTRY AND THE CENSUS.

Mr. A. R. Foote, the newly appointed electrical expert of the Census Bureau, expects to be in Washington by November 1st to assume the duties assigned him. He has written to a number of the principal electric companies requesting suggestions as to the plan to be pursued in collecting proper information, and will defer the preparation of a definite plan of operation in order to avail himself of the advantages of such advice as his correspondents may give. Mr. Foote's division of the census work will embrace matters pertaining to electrical appliances and electric light and power. The principal lines of inquiry will relate to the capital invested; number of employés and wages paid; kinds and value of materials used; kinds and value of articles produced; results accomplished, and such facts showing the history and growth of the business during the last decade as may be advisable to publish and of value to parties interested.

The collection and compiling of information relating to telegraph and telephone industries will be made by another division of the office under the jurisdiction of Prof. H. C. Adams, of the Michigan University, who has control of all matters concerning transportation. The idea of the office seems to be that the operations of *transporting* coal by a canal boat; passengers by limited expresses; messages by electric telegraphs, and oral speech by undulatory vibrations are so nearly identical that they belong in the same class. Much of the work in this division will be done by Mr. A. E. Shuman, who performed similar duties in the last census, and is very efficient.

The chief clerk of the Census Bureau is Mr. A. F. Childs, an old commercial and military telegraph operator, who has had much experience in important government positions in which he has shown good executive ability.

On Monday of this week the Julien storage battery cars commenced running on the regular winter service schedule of the Fourth avenue line, New York. There are ten cars in daily use, the first one starting out at 6.30 A. M., and the last one returning at 9.30 P. M. Each car will make five round trips per day, about 60 miles, exchanging batteries at the end of each trip. The transfer of batteries takes only from two to four minutes, the Julien Company having special facilities for doing this work quickly.

A NEW VOLTMETER.

The new voltmeter exhibited by Prof. Perry at the recent meeting of the British Association for the Advancement of Science certainly has the merit of extreme simplicity; and coming from the source it does, we should naturally expect to find it accurate and reliable. From a description of it in the English journals we gather that, like the now familiar instruments of Messrs. Aryton & Perry, this voltmeter depends on the untwisting of a metal strip, when longitudinally elongated. In this particular instrument the "new departure" consists in the peculiar form of the metal strip. It is best described by its mode of manufacture. A flat ribbon of metal is firmly held at both ends and heated red-hot, when it is grasped by the center and twisted round axially a number of times, in which position it is allowed to cool. It will at once be seen that any longitudinal strain will cause this central point to rotate, and it is to this central point that the pointer is attached. In practice it is found that a great angular deflection of the needle is caused by a very slight elongation of the ribbon, which when mounted is permanently adjusted under such a strain that the pointer has made one complete revolution. By passing a current through the ribbon it will become heated and consequently proportionally elongated, and the relief thus afforded to its permanent strain will cause the pointer to rotate backwards. As an alternating current instrument it would seem to possess the advantages of simplicity and portability; if to these can be added accuracy and wide range it will fill a long-felt want.

AN ELECTRICAL DICTIONARY.

A comprehensive dictionary of electrical words and phrases is something that has been demanded since electricity first came into commercial importance, and with the increase in electrical literature in the last few years it is rather remarkable that not until the present time has the want been filled. It has been left for Edwin J. Houston, A.M., to compile the book which is called a "Dictionary of Electrical Words, Terms and Phrases," and his work is such as to call for the highest commendation. The obstacles in the way of success, from the peculiar circumstances under which a large number of electrical terms and phrases have originated and from the fact of the same terms being employed with different meanings and new terms springing into existence almost daily as demanded by the exigencies of the occasion, have been as far as possible overcome, and the result is a work which is broader in its scope than a dictionary simply, having more the character of an encyclopedia.

In the discussion of words, terms or phrases the plan has been followed of giving first a concise definition; second, a brief statement of the principles of the science involved in the definition, and third, where possible and advisable, a cut of the apparatus described or employed in connection with the word, term or phrase defined. The difficulty in regard to the proper catchword under which to place a phrase in the alphabetical arrangement has been largely obviated by the free use of cross references. The value of the book to the outside public and to beginners generally might perhaps be increased if, in the case of the more uncommon or strictly technical words, the generally accepted pronunciation were given, but as it is the book is one which every student of the science will find invaluable and which will doubtless also supply to the public generally the information for which the universality of electric applications has made it eager. ["A Dictionary of Electrical Words, Terms and Phrases," by Edwin J. Houston, A.M. Published by the W. J. Johnston Company, Limited, New York, 1889.]

Mr. Timothy Cornwell, for 30 years connected with the New York Belting and Packing Company, died suddenly of paralysis of the brain at his home in Brooklyn last Saturday evening. Mr. Cornwell was the father-in-law of Capt. W. L. Candee, and was most highly esteemed by all who had the pleasure of acquaintance with his kindly, genial nature.

ELECTRICAL NEWS.

London, Washington, Chicago and Boston.

OUR LONDON LETTER.

The British Association. — This association, now holding their fifty-ninth annual meeting at Newcastle upon Tyne, opened proceedings last Wednesday with the resignation of Sir Frederick Bramwell as president, and the inauguration of his successor, Prof. W. H. Flower, C. B., LL. D., F. R. S., F. R. C. S., president Z. S., F. G. S., and the director of the natural history department of the British Museum, who delivered an address. The subject he made choice of may be briefly described as the educational uses of museums and the necessity of extension in order to carry out to the full the objects of the British Association as expressed in its full title, "for the advancement of science." His discourse was most elegant and able, and a fitting opening to the attractive programme of excursions and visits to various interesting works in Newcastle and neighborhood, which has been arranged by the local committee.

Edinburgh Electrical Exhibition.—The catalogue of the electrical exhibition to be held next year in Edinburgh, arranges the exhibition into two divisions. Division 1, devoted to electrical engineering and inventions, is divided into six sections, viz: 1, production of electricity; 2, electrical conductors; 3, measurements; 4, application of electricity; 5, bibliographic collection of works relating to electricity, plans, etc.; 6, historical collection. Division 2 comprises general inventions and industries in 16 sections, including mining and metallurgy, gold mining, rural industries, architecture, hygiene, foods and drinks, engineering and machinery, and woman's and artisans' industries.

The Paris Electrical Congress.—With regard to the Paris International Electrical Congress which has now closed, while admitting much important work has been done, and many useful decisions given, the weak representation of America, England and Germany has assuredly done much to damage the authority of the Congress. On the 31st ult., the French members gave a banquet to their foreign colleagues at the Hotel Continentale, to which about 350 sat down. M. Mascart presided, and speeches were also made by M. Cochery, ex-minister of "Postes et Telegraphes," M. Berger, Sir William Thomson and M. Abdank-Abakanowicz, the latter of whom, speaking for the Electrical Engineers, of America, invited European electricians to the projected Congress in connection with the World's Fair of 1892.

Immense Dynamo Casting.—Messrs. Beardmore & Co., of Parkhead Forge, Glasgow, made another large casting last Friday for the London Electric Supply Corporation, a shaft for the Ferranti dynamo, which will, when finished, be the largest dynamo in the world. The casting was a great success; it was of Siemens' steel and is to be hollowed out when cold to a diameter of 12 inches, and will then weigh about 32 tons.

Telegraphing Money Orders.—The present week discovers a very useful post office reform in permitting the telegraphing of postal orders. In addition to paying in the money and double the ordinary price for a money order, the sender has to pay for the official telegram and its repetition, and to send also an ordinary telegram to whoever is to receive the money, who then produces same with some certificate or proof as to his identity before he can receive the money. At present the amount is limited to £10 and under, and the orders will be issued only at the principal offices of the principal towns, but there is no doubt, if found successful, that the system will be extended.

Big Post Office Profits.—A very sensible suggestion in regard to increasing post office profits is embodied in a letter of Mr. Benneker Heaton to the *Times*. He proposes the following: "That all moneys over and above the present post office profits be devoted to extending, cheapening and facilitating postal and telegraphic communication throughout the empire." The profit has usually been stated at £3,000,000, at which amount he would have it stop, but up to March, 1889, the amount was almost £4,000,000.

Adopting the Electric Light.—I learn that the Midland Railway, who have for some time been using electric light in some of their principal trains, have now decided to use it on their whole service.

Edison Entertained.—Mr. Edison was entertained at a banquet at the Hotel de Ville, Paris, last Monday, given in his honor by the Town Council, and with the guests made an inspection afterwards of the machinery in the basement by which the Town Hall is supplied with the electric light. The following evening he was entertained by the Society of Civil Engineers and the next morning left Paris for Germany, accompanied by his wife, daughter and his sister-in-law. Last Friday he visited the establishment of Messrs. Siemens & Halske at Berlin, where a number of scientists had assembled to witness some extremely interesting experiments with the phonograph made by Mr. Edison's representatives in Berlin and Paris, Herr Wangemann and Mr. Hammer.

Extensive Isolated Lighting.—Very extensive alterations and improvements are in progress at Drury Lane theatre and the whole house is now to be lighted by electricity. An installation is also being carried on at the Duke of Argyll's principal seat in Scotland, Inveraray Castle, and Messrs. Laing, Wharton and Down inform me they are now increasing their installation of two years since at the Rothschilds' mansion at Tring, which now consists of 25 tons of accumulators and is the largest private plant in this country.

Electric Lighting in India.—Messrs. Octavius Steel & Company, of Calcutta, the Indian agents for Messrs. R. E. Crompton & Company, recently made a proposal to the Calcutta port commissioners to light the jetties, the Hoogbley pontoon bridge and the wharves by means of electricity, and which has now been accepted. Forty-two 2,000 candle-power arc lamps are to be distributed. Messrs. Steel & Company made another proposal to the public ways department of Bengal that they should light up the Calcutta Naidans, but the offer was declined.

Messrs. Crompton & Company will not be permitted to have the entire field to themselves, however, as Messrs. Laing, Wharton and Down have sent a representative to India for Thomson-Houston work, and have supplied him with a large and varied assortment of their special and unexcelled art fittings for electrical work. I hear also of another company, the Anglo-American Brush corporation, who are represented in the East by Mr. R. P. Sellon and who has already visited Singapore and Penang, and is now going to Bangkok in Siam, where the king has ordered electric lighting in an extensive way for his palace, and several Siamese princes and nobles are following his example and require electric light installations to be put up.

The Telephone Ear Again.—The requisite permission has been granted to the National Telephone Company by the Prestbury (Cheshire) highway board to erect poles carrying wires along the roads towards Congleton from the Macclesfield boundary. This connection will bring Lancashire and Cheshire into direct communication with London. With reference to telephones, Dr. Gellé is calling attention on the continent to the consequences of a continual use, telling of one case where a most intelligent man who had to listen frequently for long periods together to telephonic communications, was brought to a state of nervous excitement with hyperesthesia of the hearing and the ear itself, so that the sounds caused vertigo and ringing in the ears, and finally, to the persistence of alarming vertiginous sensations. By a complete rest the troubles were removed.

Personal.—Mr. J. R. Williamson, M. I. E. E., the managing director of the Manchester Edison-Swan Company, has been compelled, owing to ill health to give up his position, and is leaving immediately for Australia, where he will occupy himself with a new company now in course of formation. He carries with him the heartiest good wishes of his fellow directors, who will have some difficulty in filling the position he has vacated.

New Designs in Electric Fixtures.—I had the pleasure the other day of being shown by Mr. Wharton, of Messrs. Laing, Wharton & Down, 82 New Bond street, London, their splendid collection of electroliers, brackets and general electric light fittings. A later novelty is a candelebra in which the electric light passes through a body shaped as an ordinary wax candle, and the top of which is of a toned down color to represent the flame. There may be as many branches as may be desired. It is most ingenious and should have a large sale.

Removal.—I am advised that the chief offices of our esteemed contemporary, *Industries*, are now removed from Manchester to London, and will be situated at 358 Strand, W. C., instead of 22 Wellington street, W. C., as formerly. C. FF.

London, Eng., Sept. 18, 1889.

OUR WASHINGTON LETTER.

A Good Beginning.—The Brightwood R. R. Company carried last Sunday 1,200 passengers and turned 200 more away. There were but six cars running. It is expected that when the electric cars are introduced that the capacity of the line will be largely increased. It will be remembered that I expressed an opinion some time ago that the road would be a success.

Another Job for the Motor.—The Registrar of the Treasury intends using the electric motor to run the machine that cuts and cancels notes. This is to obviate the jar and vibration of the walls due to the overhead shafting formerly in use.

Motor Sales.—C. W. Messner, of the "C. & C." Motor Company, reports that he has sold 36 horse-power in two months. One motor of 20 horse-power runs the presses of the *Evening Star*. One of five horse-power runs a freight elevator in an uptown livery stable. Among others are 50 one-eighth horse-power fan motors, distributed through several of the government buildings. He intends operating on an extensive scale next summer, and will supply fans of all kinds.

An Ingenious Contrivance.—Mr. Messner desiring to avoid the trouble and delay of removing the lamp in the field circuit and inserting a plug whenever it is desired to increase the speed of the motor, has devised a modification of the Edison socket, in which, by reversing the switch, the current is short-circuited through the tongue of the socket, and the speed thereby augmented.

The Resignation of Lieut. F. Jarvis Patten has been accepted by the President. It will be remembered that Lieut. Patten is the inventor of a number of electrical improvements, among others several systems of synchronizing motors, as well as a new type of alternate current motor.

Happening to notice the reasoning of Mr. C. C. H. (issue of Sept. 14, '89) with regard to Chicago's claim to the World's Fair, on account of "priority of invention," I would remark that Mr. H's argument is analogous to that of the gentleman who claimed the invention of the telephone because he had once said that they ought to *talk* by telegraph.

Electric Decorations.—At the banquet given to the International Congress of the Three Americas at "La Normandie" there was rather a unique decoration. In the center of the table there was a rectangular aperture filled with South American plants. On the four sides of the rectangle were 65 incandescent lamps in variously colored shades; among the plants appeared 35 more, which last were affixed to sticks embedded in the earth of the pots, making the total 100; not a socket, switch or wire was visible. The effect was particularly fine. Secretary Blaine is quoted as saying that it was "the prettiest table that he ever sat down to." The credit of this due to Mr. John R. Galloway and Mr. C. W. Messner, who engineered the work.

Notes.—The work on the Georgetown and Tenallytown R. R. (electric) is being rapidly pushed.—I am informed that the work at the Navy Yard is delayed until the completion of the specifications.—The motor car for the Brightwood R. R. has not yet arrived.—The Pennsylvania train bearing the delegates to the International Congress of the Three Americas was lighted from a dynamo in the baggage car. G. E. M.

Washington, D. C., Oct. 4, 1889.

OUR CHICAGO LETTER.

Change of Management.—A Sunday journal announced this week that the management of the Thomson-Houston Company's affairs was about to fall into the control of Mr. B. E. Sunny, who has been for some months in the Thomson-Houston Company's office here. Manager Barton, who came to Chicago expecting only to remain temporarily, will return to Boston, and Mr. Sunny will take charge some time between now and the holidays. Mr. Barton is entitled to the credit of placing the Chicago Electric Club in its present prosperous and enviable position, and the Club will sadly miss him when he has left the city.

Chicago Electric Club.—The first of the fall meetings of the Club was held on Monday last, when Prof. Badt, of the Edison Company, read a paper on "Magnetic Sounds in Electric Light Appurtenances," which was illustrated by diagrams. The discussion which followed was participated in by Armstrong, Cutter, Haskins, Prof. Cook, of the North Western University, and others.

Cash Balance.—The treasurer's report showed a balance, after paying everything, of $246.96. This was considered pretty well, as the report was one covering the last day of the quarter, when club treasuries are usually empty if ever.

Merchandising the Current.—At the last meeting of the City Council Alderman Cullerton introduced a resolution which was adopted, directing the city electrician to furnish an estimate of prices at which the city would furnish electric light to individuals or private corporations. Now the points are raised that it is neither competent nor necessary for the city to do this inasmuch as the former specification, it is claimed, is contrary to the charter provisions, and as to the second the companies are filling the demand with satisfactory supply, and at reasonable cost. When the city gets her streets properly lighted, then will probably be a good time to decide the question of merchandising electricity.

Hitch in Station Construction.—As the street lighting question stands to-day there is a serious hitch on the South Side. While the other stations are progressing with commendable rapidity, the site for the South Side plant, next the Exposition building on the lake front, is held *in hoc* by an injunction. The underground conduits are already laid to the point, and the city authorities are endeavoring to get this "carbuncle on the body municipal" removed. The Professor says he either wants to go ahead there, if possible, or if not, then somewhere else, pretty tolerably darned quick, because the days are getting short and cold weather is coming on.

An Error Corrected. — A correction is necessary in an item which appeared in last week's Chicago letter, Mr. F. W. Horne was reported as going into the railway department of the Excelsior Company. Mr. Horne has gone round the corner into the Thomson-Houston railway department, desk and all. Correspondents please take notice, as the messenger of the Excelsior is a very light built person, and should not be burthened with lugging Mr. Horne's misdirected correspondence to him. Write him care of the T.-H. Company.

The February Convention.—Kansas City is preparing for the February meeting of the N. E. L. A. Coates' Opera house, across the street from the headquarters of the Association—Coates' Hotel—has been secured for the meetings, while the overflow from that caravansary will be cared for at the Midland Hotel. President Weeks says the citizens and the electrical portion, especially, are wide awake and enthusiastic, and the prospects for a grand re-union are unusally encouraging. C. C. H.

Chicago, Oct. 6, 1889.

OUR BOSTON LETTER.

Personal.—Mr. George Westinghouse, Jr., than whom hardly any man is better known throughout the country, favored Boston with a short visit last week, arriving Monday evening and leaving on Wednesday. While in town, Mr. Westinghouse made his headquarters at 620 Atlantic avenue, where are located the local offices of both the Westinghouse Electric Company and Westinghouse, Church, Kerr & Company.

The Janitor Was Pleased With It.—In one of the large city churches a Ruhmkorff coil and batteries are used for the electric gas lighting. Some time since the Samson battery was introduced, and recently upon inspecting the apparatus the superintendent was told by the janitor that the new batteries were good and convenient and must be strong, because it was ready for work all the time. All he had to do, so he stated, was to turn on the gas and it was ignited immediately without his touching the button. Upon investigation it was found that the circuit was closed and that the battery and coil had been working continuously for a week, throwing out spark after spark, but was still in good order.

The Beverly and Danvers Road.—The Union Electric Car Company are entertaining to-day a large party of guests who are inspecting the new storage battery street railway connecting Beverly and Danvers. Among the party which is in charge of Mr. J. H. Alley and Col. E. H. Hewins, are D. H. Bates, vice-president of the Accumulator Company, of New York. Messrs. J. N. Keller, W. J. Denver and F. A. Houston, of the N. E. Telephone Company, Mr. John I. Baker, of Beverly, and prominent citizens of Lawrence, Haverhill, Worcester, North Adams and neighboring cities. Mr. William L. Stevens is in charge of the cars, which will begin regular trips for public traffic on Tuesday.

The Marr Construction Company.—Mr. Norman Marshall, formerly in charge of the local office of the Marr Construction Company, has been appointed district engineer for the Westinghouse Company. The Marr Company is doing a large business in this vicinity, among the recent installations being one of 300 lights, Westinghouse direct current, for the Overman Wheel Company, Chicopee Falls; a central station plant at Bridgewater, where the contract includes a brick building, a Manning boiler and a Westinghouse compound engine; a 300 light plant for the Hartford Woolen Mills, another of the same size for the Oldtown, Me., Woolen Mills; a 50 light plant and a Westinghouse standard engine for the Boston Towboat Company; 300 lights at Braintree, where house electric lighting is becoming very popular, and a pole line contract at Springfield, Mass., where 300 southern pine poles have been put in. The Marr Company accomplished some quick work at the Plymouth County Fair recently at Bridgewater, a temporary exhibition plant being put in on a few hours notice and run with success.

Boston, Oct. 7, 1889. T. W. S.

The Electrical Tricycle.

To the Editor of Electrical Review:

The illustration and partial description in your current issue of an electrical tricycle invented by Mr. M. M. M. Slattery must be of great interest to your readers, many of whom believe that within a few years electrically propelled vehicles in our streets will be the rule rather than the exception, as at present. Believing that some further details will also be of interest, allow me to add the information that the Slattery electrical tricycle is propelled by a Perret electric motor, manufactured by the Elektron Manufacturing Company. The satisfied smile depicted on Mr. Slattery's face as he bowls along is no doubt due to the fact that he has behind him a motor possessing in the highest degree the two essentials for such service—light weight and high efficiency.

Yours truly,

E. H. Cutler.

Brooklyn, N. Y., October 5th, '89.

Telephonic News

*** The annual meeting of the Edison Phonograph Toy Manufacturing Company will be held in Boston October 17th.

*** Mr. J. P. McKinstry, general manager of the Erie Telephone Company, is putting down 20,000 feet of conduit, similar to the Chicago system being put down by Supt. Wilson in that city, in the city of Cleveland.

*** Telephonic communication has now been completed between Stockholm and Gothenburg, thereby connecting the south and central portions of Sweden with a large part of the north. Stations in every town touched by the telephonic cable, which has taken nine months to construct, will be maintained by the Crown.

*** The headquarters for the Northwestern Te ephone Company will be moved to St. Paul from Minneapolis on December 1, to the third story of N. H. Rogers' new building on Fifth and Cedar streets. The new $50,000 switchboard will be put in there and the company will be in better shape for business. They have leased the new quarters for 20 years.

*** A catalogue of the subscribers to the telephone exchange was issued this week, says the Wheeling *Graphic*, and with it an order that all calls, to receive attention, must be by number. This innovation created somewhat of a hubbub and was a leading topic of discussion everywhere for a day or two. Squire George Arkle has sued the telephone company, in Squire Davis's court, claiming damages in the sum of $300 by breach of contract. The operator at Central insisted on his calling by number, according to the new rule, which he says is an added condition to his contract to which he did not assent, and that he has not time to hunt in a book for numbers. The telephone people say the calling by numbers relieves the operators at Central of a severe mental strain, contributes to the privacy of communications and adds to the promptness and efficiency of the service. It is probable that after people get used to the new system it will be found to be an improvement. Mr. W. L. Callin is now engaged by the telephone company in preparing a new telephone book, which will be issued during the coming week. It will comprise only subscribers in Wheeling, Bellaire, Martin's Ferry, Bridgeport and Moundsville.

*** Some interesting telegraphic and telephonic statistics, for which we are indebted to *La Lumière Electrique*, are as follows: "The total length of the telegraph lines of the world amounts to 557,064 miles. Europe, 216,490; America, 163,642; Asia, 46,800; Australia, 24,204, and Africa, 12,060 miles. There have to be added 950 submarine cables, 774 of which are laid in European seas and have a total length of 3,200 miles, while the remaining 176, with a length of cable of 85,850 miles, belong to companies. The service of these lines is carried out by 160,000 offices. Telephonic statistics are as follows: The United States, 739 exchanges and 158,712 subscribers; Germany, 164 exchanges and 31,325 subscribers; England, 122 exchanges and 20,420 subscribers; Sweden, 137 exchanges and 12,864 subscribers; France, 28 exchanges and 9,487 subscribers; Switzerland, 71 exchanges and 7,626 subscribers; Russia, 36 exchanges and 7,589 subscribers; Italy, 28 exchanges and 6,183 subscribers; Belgium, 4,674 subscribers; Austro-Hungary, 4,200 subscribers; Norway, 31 exchanges and 3,930 subscribers; Holland, 9 exchanges and 2,872 subscribers; Spain, 2,218 subscribers; Denmark, 1,837 subscribers; Portugal, 2 exchanges and 890 subscribers. The town with the largest number of subscribers is Berlin, having upwards of 10,000, and followed by New York, 6,900, Paris with over 5,000 and London about that amount."

Telephone Connection Between London and Paris.

BY W. H. PREECE, F.R.S.

Paper read before the British Association September, 1889.

The practicability of speaking by telephone between London and Paris has recently been carefully examined both by the French and the English electricians. The distance between the two places is 275 miles, viz: 74 miles between London and Dover, 21 miles from Dover to Calais, and 180 miles from Calais to Paris. It is very easy to speak over such a distance, if the wires be aerial and of thick copper, but the insertion of underground wires at each end, and of a cable in the middle, place difficulties in the way that have to be surmounted. It is not a question of apparatus—it is solely the distribution of the electrical resistance and capacity of the different portions of the line, and the arrangement and material of the wires.

Speech is already commercially maintained between Paris and Brussels (190 miles), Paris and Lille (158 miles), Paris and Rouen (80 miles), Paris and Havre (135 miles), Paris, Lyons and Marseilles, the latter being a distance of nearly 600 miles; but in all cases they are aerial wires, excepting for a short length (about two miles) of underground work in Paris.

The author has experimented on the cables between Dover and Calais, between Holyhead and Dublin, and between South Wales and Wexford. The conditions to be fulfilled are very simple. The circuit must be metallic, the material must be copper, and the product of the resistance of the line, R, and its capacity, K, must not exceed a certain figure. It has been determined roughly by experiment that when

K R = 15,000, speech becomes impossible.
= 12,500, " " possible.
= 10,000, " " good.
= 7,500, " " very good.
= 5,000, " " excellent.
= 2,500 or under, speech becomes perfect.

We have thus a species of Beaufoy's scale applied to telephonic communication.

A circuit approaching as nearly as possible one between London—Paris was made on an artificial cable and it was found to comply with the requirements.

An actual circuit was then made from Worcester, through 27 miles of the London underground system to Baldock, on the Great Northern Railway, giving similar electrical conditions, and with the same result.

It may be considered as absolutely settled, that speech is possible between London and Paris.

In the United States, speech is maintained between New York and Boston (350 miles), and in many instances to distances exceeding that between London and Paris, but they have not to surmount the difficulties of underground wires at each end and of a cable in the middle.

In the discussion which followed, the President (Mr. William Anderson) asked why the experiment was not tried direct between London and Paris?

Mr. Preece said the reason was that all the wires between London and the coast and between Calais and Paris were iron wires, and it was quite impossible to speak over an iron wire to a greater distance than 100 miles. It was only possible to speak at long distances by the aid of copper wire.

Mr. Biggs asked Mr. Preece whether the highest figure he had given was the absolute limit to which the telephone was possible, or whether, with an alteration of the transmitter and the receiver, it would be possible to have telephony with a higher product than 15,000.

Mr. Preece replied that 15,000 was the limit now with the present apparatus and with the present means. He did not anticipate any advance in the apparatus; the apparatus itself was nearly as perfect as one could hope it to be, but he did anticipate very great advances in the means of carrying the currents in the form of conductors and in the form of the circuit. They were now quite on the threshold of the subject. The introduction of the telephone and the introduction of alternate current working in electric lighting were quite opening people's minds to a new field in electricity, and they did not know where they would go to. All that was known was that at the present moment they were on the shore of some unlimited sea, and what might open in the next 10 years they could not tell.

Telephony.

M. de la Touanne says in our esteemed contemporary, *The Telephone*, that telephony has within the last 10 years, by rare good fortune, spread over the whole world, and the instrument, which had at first been looked upon as a toy, has become the basis of an industry which extends its domain from the little hamlet to the mightiest city. But the very rapidity with which this industry has spread constitutes a danger. Scarcely has a system been adopted, when another more ingenious and more practical is started, and it has happened that a company, anxious to give to its subscribers the best possible service, has given up a system the installation of which had hardly been finished, in order to create a network in harmony with recent progress.

Such a step is only an exceptional one, and if on a smaller scale these difficulties crop up every day, they might in most cases be avoided by a more frequent interchange of ideas between those who are in charge of these installations; questions concerning the lines, apparatus, central stations, tariffs, assume the most varied aspects, and it would, therefore, be of the greatest importance that competent persons should consult each other on the solutions already attempted, and on those already effected. As regards the lines, it seems that a settled opinion has been arrived at on the nature of the conductor. Copper and its alloys have gradually replaced iron and steel; yet it has to be determined in which cases this substitution is a certain advantage, and the results obtained under the most varied conditions with bronze, hard-drawn and hot-drawn copper have still to be sifted.

The latter, by its feeble tenacity, seems reserved for cables; but the latter have probably not arrived at their final and definite stage. A great number of types have been proposed: what are their precise specifications, their advantages and drawbacks? At what resistance, at what capacity ought we to stop in practice? How many wires can conveniently be joined into one cable? What modifications ought to be adopted in the manufacture of a cable according as the circuit is a simple wire or a metallic one? On this point of metallic circuits what are the details of construction employed for air lines? Is it not possible, as has been recently stated, to reduce the number of conductors and employ a common return wire for a whole group of out-going wires? In this case what would be the arrangements necessary for running a number of such wires on the same posts, etc.? These are a few of the questions which cannot be answered until a certain number of competent telephone engineers, on the basis of the experience they have gained and of the facts they have elucidated, discuss the practical results obtained in telephony.

As regards apparatus the task is a simpler one, at least, if we confine ourselves to notorious results. Microphones, telephones and auxiliary signals belong to a few categories only; they differ as a rule in details only which are of a purely commercial interest. The microphones derived from the original arrangement by Hughes have the great advantage of being regulated once for all; those constructed after the Edison model are, however, still employed in many network; finally, granular microphones have also a great number of adherents. If the precise methods of measurement, which are at present under consideration, do not shortly give comprehensive results, it would be desirable that the qualities of the different types as evinced by daily usage should be placed in evidence.

The telephones, on the other hand, have greatly exercised the spirit of innovation; the known principle, the different forms of electro-magnets, would naturally invite a trial; inventors might frequently have hesitated in presenting certain forms as new if they had consulted previous investigations on electro-magnets, those of Nicklès, for instance. In fact, at the present time, we believe that there exist several types of telephones of similar excellency, one as good as the other if well constructed. It is desirable, in the interest of ulterior progress, that the relative influence of the different parts of the instrument should be acurately fixed.

Auxiliary signals, call-bells, annunciators, etc., are modifications sometimes ingeniously contrived, but not of paramount importance, of telegraphic apparatus known for a long time. It is the same with many combinations in which these accessories play a part: Wheatstone bridge, differential mounting, etc., which belong to telegraphy. Whether it be the question of a Morse, a call-bell or an annunciator, they present no difficulty. Fertile innovations might be introduced in combinations for joining several subscribers by one exchange wire, or in arrangements for automatic communications.

Amongst the accessories, one of the most important, the battery, is perhaps the one which leaves most room for doubt; the determination of the most favorable element for transmissions would be useful.

As regards central stations, several points deserve special attention. First of all presents itself the question of switchboards; what facilities ought they to present? How many subscribers ought a central station to have before being provided with that ingenious arrangement, the multiple board, which, coming from the New World, gradually spreads in the Old? These are elementary questions, a knowledge of which is indispensable; the simplification and the safety of the operations demanded of the assistant are of capital importance when these operations are repeated hundreds of times during the day. Prime cost in this case becomes of secondary importance, and increase of expense is often more apparent than real. In any case, rapidity, the *raison d'être* of telephony, even if bought at a momentary sacrifice, is the first requirement to be consulted; and the diversity of systems is such that, according to the type of switchboard adopted, the number of communications established by one assistant can rise from 200 per day to 200 per hour; these figures are not exaggerated, the maximum can even rise higher. Under these circumstances it will be seen that the choice of material of the central station is of paramount importance.

And yet the fruit of this work of installation would be partly lost if judicious regulations did not insure its reliable working; it would, therefore, be very interesting to compare the regulations observed in different networks, the instructions given to subscribers as well as to assistants, and to know the advantages and drawbacks which experience has revealed in their application.

To quote one detail only: In the New York network every demand of communication is considered as persistently valid until it has been satisfied; in most of the other networks the demand must be renewed by the calling subscriber after he has been informed that it cannot be attended to at once. The former of the two systems affords an undeniable advantage to the subscriber; but we have to consider at the same time in how far it hinders the service to the detriment of the new communications demanded; besides that, it would appear that the calling subscriber ought, after a certain time, forego his call; arguments for or against can only be supplied by those who have tried both systems. This particular point, of course, has only been selected for the sake of example, and only illustrates the different sides taken up by competent men and the uncertainty which still prevails.

Another cause of prosperity or of failure of telephonic enterprises is the tariff adopted by the exploiting parties. Like every other industry, telephony, in the first instance, seeks for a *remunerative tariff*, *i. e.*, a tariff which, in consideration of the number of communications and of the rate charged for them, gives, after deduction of all expenses, the maximum income for the capital engaged. It is difficult to estimate the expenses in a general way; they depend not only on the material used, but also on local conditions; in each particular case, however, this is a point which will be pretty well known; the second point, the law according to which the rate to be charged is governed by the number of communications or of subscribers, is, on the contrary, completely unknown; the

provisions in this respect are almost always erroneous. It would, therefore, be a most interesting task to establish this law; unfortunately we have very little information to go upon.

In most cases rates are fixed and modified without any preconcerted plan; reductions (we do not speak here of raising the rates, which is exceptional) are felt by sudden fits and starts, and it is a delicate point to seize the connection between the lowering of the tariff and the increase of traffic. As regards the information to be gained from a comparison between the numerical importance of population and the number of inhabitants, it is of little value. In one and the same town the significance of the numbers figuring in these statistics depends on several conditions, length of time during which the network and the tariff have been established, regularity of service, etc.; in short, questions which are generally passed over in silence. On the other hand, if we wish to compare the results obtained in different localities, we must know the character of the inhabitants, the nature of the social relations there prevailing, and which depend on the ordinary occupations, the climate, the material prosperity, and the kind of mechanical operations carried on in those localities.

Until now the telephone has been a commercial instrument, and it would probably be easy to classify apart those towns where it is only an article of luxury; but amongst the others it would be nececessary to draw a parallel between those only which are really comparable. As regards industrial or commercial centers one would probably have occasion, in case of the former, to distinguish amongst the industries those which give rise to a limited number of transactions only, but important from the sums engaged, and those where sales and bargains are numerous, but only involve comparatively small outlay; in the case of commercial centers a safe criterion of the activity of stock and other exchanges would be required.

All these points alluded to simply tend to show the complexity of the problem of drawing any safe conclusion as to the probable development of telephonic industry, but at the same time they also clearly point to the importance, nay, even the necessity, of holding a telephone convention for the interchange of ideas, which has been so strenuously advocated in our columns.

The American Institute Fair.

The Annual Fair of the American Institute was opened last week and starts off with every indication of being a successful exhibit. In addition to the usual interesting industrial exhibits are a number from the electrical industry, of which we mention a few at this time.

The buildings are well lighted by 100 Schuyler arc lamps of 2,000 candle power each. The Schuyler exhibit, located in the lower end of the main hall, is in charge of R. W. Vorhees, and consists of three dynamos of the improved Schuyler pattern, also an automatic regulator, furnished with a valve invented by Mr. Voorhees and designed to reduce the attention required by the machine to a minimum, and to render its operation more economical.

The Wenstrom Northern Electric Company exhibit a seven horse power dynamo with 100 lamps, and a two horse power electric motor of the Wenstrom improved type. The Wenstrom Company are using the Sawyer-Man lamps exclusively.

The Continental Dynamo Company, of New York, show their new dynamo, operating 100 sixteen candle-power incandescent lamps; also three additional dynamos not in use, of 50, 400 and 80 lamps. There is also shown a large incandescent lamp having an intensity of 100 candles.

The incandescent lamps for practical lighting purposes, 400 in number, are operated by two Mather dynamos. The Schieren perforated electric belting is used.

The exhibit of the American Leather Link Belt Company, of New York, shows the belt in process of construction.

The Fair is well worth a visit.

The Accident at Scranton.

To the Editor of Electrical Review:

An article appeared in your issue of October 5th inst., over the signature of Lathrop R. Bacon, president, claiming to be an explanation of the recent accident to Doctor Hand and his horse, in Hyde Park, Scranton, with a view of setting to rights "unjust criticisms of the electrical overhead system" and the balancing of the "prejudiced minds of those who claim that the overhead street railway wires are a menance to life."

Unfortunately, Mr. Bacon seems not to have been fully informed as to the facts of the accident, but contents himself with what appears to be a statement by Dr. Hand, the injured party; "that the telephone wire was in contact with an electric light wire—not with a wire of the People's Railway Company—and from that he received the shock."

Mr. Bacon claims that all the guy wires or span wires of his railway are insulated. This is true, nominally. The guy wires or span wires of the railway in Scranton, supporting the main trolley wire, are supposed to be insulated by a break in their continuity near the trolley wire by means of a medium sized porcelain insulator. There is a difference of opinion as to the effectiveness of such insulating appliances, but ordinarily, if in good condition, they may prevent the passage of sufficient current to endanger life. At the point where this accident occured there is a sharp curve in the railway making a greater number of guy, span and brace wires necessary to support in position the railway wire system; this was further stayed by the introduction of a *stretcher* wire attached to and guying two of the span wires together. By careless workmanship this *stretcher* was so connected as to electrically bridge over the porcelain insulators in use, thus throwing the main trolley wire in full electrical connection with the span wires all the way out to the supporting poles; and on this span wire, fully charged, the telephone wire fell.

No less than three practical electric men were on the spot directly after the accident, all of whom made a careful examination as to the cause of the accident, and all of whom will be willing to testify if required.

The overhead electric railway system is not likely any more of a menace to life than hundreds of other commercial necessities when properly constructed and maintained with a view to safety; but the chances are that Mr. Bacon can more readily convince the citizens of this by good and careful appliances and workmanship, rather than by writing articles to prove the fault to lie with the electric light companies. Very truly,

R. M. Bailey.

Williamsport, Pa., Oct. 5, 1889.

Complimentary Dinner.

Mr. H. McL. Harding, for several years general agent of the Sprague Motor and Manufacturing Company, of New York, will in future make his headquarters in Chicago, and have charge of the western mining work of the Sprague Company, which has grown to such dimensions as to demand a special department. Before his departure Mr. Harding was tendered a complimentary dinner at the Hoffman House, October 1st, 1889, by the following named gentlemen: E. H. Johnson, A. S. Reves, F. J. Sprague, J. H. Vail, C. A. Benton, G. W. La Rue, E. E. Higgins, H. F. Parshall, E. V. Cavell, T. C. Martin, A. H. Chadbourne, C. W. Dever, W. H. Temple, Chas. W. Price, J. S. Wise, S. D. Greene, A. T. Starkey, C. W. Jenks, E. Whitestone, Theo. Beran, S. S. Wheeler, W. W. Monroe, S. Z. Mitchell, H. W. Blake, O. S. Crosby. A number of toasts were responded to by the eloquent electrical workers, Mr. E. H. Johnson leading off with "Speed the Parting Guest." The occasion was a pleasant one, and will always be a source of agreeable memory to Mr. Harding.

.... Telegraphic communication with the top of the Eiffel tower was opened last Monday, and the first telegram was sent therefrom by the English *Times* Parisian correspondent.

Series Electrical Traction.

By Edward Manville, M.I.E.E.

Abstract of a paper read before the British Association September, 1889.

The expenses of horsing a tramway form such a serious proportion of the total working expense that any cheaper effective method of propulsion will naturally be gladly received by the various companies.

Steam and compressed air have been extensively tried, and although in some cases their expense has compared favorably with horsing, the machinery used is so cumbersome and the nuisance so great, that even companies who have incurred the expense of abandoning horses in favor of steam are seriously meditating the adoption of electricity.

The subject of electrical traction reached such a degree of prominence in this country that early last year steps were taken to demonstrate the practicability of running electric motors for tram-cars in series with each other, and an electrical tramway on the series system was equipped and put into operation at Northfleet.

The essential parts of an electrical tramway line in which the motors are run in series are: An electric generator, producing a current of constant quantity and an electrical pressure varying continually according to the total work being done by the whole of the motors together; the conductor taking the current from the generator to the motors provided with automatic switches of such a character as to enable the continuity of the conductor to be broken as long as the motor is in electrical contact with the open ends of the conductor, and to be closed as soon as the motor, in passing away, ceases to be in contact with the ends of the conductor.

This operation must be performed without disturbing the metallic continuity of the circuit, and without short-circuiting the motor.

The generator used at Northfleet is one of Statter's patent constant current dynamos, in which type of machine the E. M. F. is varied by the alteration of the position of the brushes on the commutator effected by an electrical regulator. The current, after passing through the regulator, goes to a highly insulated cable, reaching the whole length of the line. The cable is cut at distances of 21 feet along the line, and the ends of it are led into terminals connected with the opposite faces of a "spring-jack," which is at the same time the automatic switch and contact point from which the current is collected. From the last "spring-jack" at the end of the line, a return cable, with its insulation unbroken, is brought back to the other terminals of the generator, owing to the line at Northfleet being a single track.

The "spring-jack" just referred to consists of a pair of glazed earthenware blocks, 14x3x4 inches. To each block is attached, by means of a double spiral ring, a gun-metal casting, curved at the ends, but flat in the center. The springs are of sufficient strength to press the two castings together with a force of six pounds. Under the car, and for its entire length, is the collector, or "arrow," which consists of two thicknesses of india rubber belting, each having a broad brass strip riveted to it for nearly its entire length. The nose of the "arrow" at each end is shod with wrought iron, brought to a knife-edge, so as to easily force its way between the two faces of the "spring-jack," which automatically close after its passage. The conductor on each side of the "arrow" is lapped round one end, and an insulated space is left, slightly greater than the surface of contact of the "spring-jack," near the extreme ends on opposite sides. By these gaps, the passage of the collector from one "spring-jack" to another is effected without short-circuiting the motor.

The conductor on each side of the arrow is connected by an insulated cable with the motor carried on the car. On each platform of the car are two strong switches. One of these serves to reverse the direction of the rotation of the armature by altering the connections between the field magnets and the armature, the other regulating the power of the motor by shunting more or less current for the field magnets. Three speeds are provided for, and the stopping of the car is brought about by completely short-circuiting the field magnet, still allowing the current to pass through the armature.

The motors are run at 400 revolutions per minute, delivering at this speed, when the field magnets are fully excited, 15 horse-power on the brake. This slow speed was adopted to do away with intermediate gearing between the motor shaft and the car shaft, which has up to this time been the usual practice.

At Northfleet the motor pinion gears direct with a spur wheel on the car shaft in the ratio of 1-4½. The gearing is double helical, with a view to noiseless running, and the practical working of this gear is most satisfactory.

The motors are mounted in a way now generally adopted in the United States, one end being supported by two half bearings on the driving shaft of the car, the other end being suspended by a spiral spring from a stout beam across the car body.

The motors are of the Elwell-Parker type, and the field magnets are connected in series to the armature. The generator is driven by a Robey compound under-type engine of 10 horse-power (nominal), with a locomotive boiler over it.

The appearance of the tramway on the road surface is in all respects similar to that of an ordinary tramway, the conduit through which the "arrow" travels, and in which the "spring-jacks" or contact points are situated, being formed beneath one of the running rails. This running rail differs from the ordinary tramway rail, inasmuch as the tread and guard portions consist of two separate and independent rails, having a narrow slot ⅜-inch in width between them, through which the mechanical connections between the "arrow" travelling in the slot and the car body are situated. The rails are supported by means of cast-iron chairs or yokes, to which they are securely bolted. These yokes are placed at intervals of about 4 feet, excepting at the rail joints, where they are closer together, the sides and bottom of the tube between these yokes being formed of Portland cement concrete. The rails are made in 21 feet lengths, corresponding with the distance apart of the "spring-jacks," and at each rail-joint a special chamber is formed, having a convenient removable lid, by means of which access is obtained to the "spring-jacks." The center of the tube is placed somewhat inside the track, in order that the "arrow," when travelling, shall not be directly underneath the slot, so as to avoid the danger of water from the road surface in wet weather falling directly on the "arrow," and also with a view to protecting the "spring-jack" cheeks themselves in a similar manner. The cable joining the "spring-jacks" is led to an independent 3-inch earthenware pipe, running from chamber to chamber, and in this tube also is laid the return cable. Some special construction of points and crossings is necessitated, owing to the junction or crossing of the two tubes underneath the track, which involves a considerable projection of unsupported tongue. The mechanical details of the system were designed by Mr. Joseph Kincaid, and carried out for him under the supervision of Mr. J. S. Waller.

It may be well to point out, in series running, that, owing to the employment of a current of constant value, it is impossible for the most inexperienced car driver to damage his motor by either too rapid starting or by reversing whilst running; indeed, it is a positive advantage when descending a hill to check the speed of the car by altering the field connections so that the armature tends to revolve in the opposite direction to that in which the car is travelling, as the power that would otherwise be lost in braking the car is actually added to that produced by the generator, and thus large systems, with many cars and varying gradients, would appreciably reduce the total power required to be generated, and the consequent consumption of coal.

These advantages, combined with the efficiency of distribution as regards the percentage of power lost in the conductors, with, at the same time, but a low difference of potential at the terminals of each individual motor, may be regarded as the main advantages of series running.

In reply to queries, Mr. Manville said the points occurred on the level of the shank, they would be about on the rail-level. Everything was quite clear down below; there were simply two tubes for the arrow to travel in, and the shank was guided by the point on the rail-level so as to bring the arrow in a proper direction—the same direction as the car was travelling in. The points worked quite automatically, and they were pressed over by a spring in one direction. The maximum gradient was 1 in 32, and it was nearly a quarter of a mile long. They had had no trouble in running up the gradient. The cars carried 26 passengers inside. At Northfleet with two cars the pressure might rise to 500 volts; the average would be from 300 to 350 volts. The effect of reversing the motor in checking the speed of the car going down hill is a very important point. It is not seen, perhaps, at first sight, that in running in parallel it is practically impossible to utilize the brake-power of a car going down hill. The advantage was only got from it at the few moments when the motor is running at a higher electro-motive force than the generator. In series running, where each motor forms an integral part of the circuit, reversing the direction and the rotation of the armature of the motor adds volts to the system which are taken by the generator, and therefore by the steam engine, until the very moment at which the car is stopping. At Northfleet they could actually turn the engine back against the steam when they were going down hill, that is to say, the power developed by the car going down hill passing through the circuit is more than that at the engine at the moment.

.... During the recent State Fair at Topeka, Kan., the grounds were lighted at night by arc lights.

* * The Albany City street railways contemplate changing the entire system from horses to electricity.

* * The Watervliet, Turnpike Railway operated by the Thomson-Houston system, between Albany and Troy, and passing the government arsenal, was opened for public business last week.

* * A very simple electrical device for giving an alarm in case of fire in any part of a building has just been introduced at the Fifth Avenue Hotel, Troy, N. Y. It is connected with all of the push buttons, and operates on the same principle as the sprinkler system. A spring held down by soft solder is relieved and gives an alarm as soon as the temperature of an apartment melts the composition.

* * The Des Moines Street Railroad Company, Des Moines, Iowa, filed amendments to its articles of incorporation with the county recorder. The capital stock is increased to $1,250,000. And the board of directors is authorized to use the capital and bonds in paying off the debts and in purchasing and recovering the franchises of the Des Moines Electric Railway Company, and in bringing about a consolidation.

Trial of an Electric Boat on the Housatonic.

A new method of navigating the waters of the peaceful Housatonic river is just now attracting attention in Ansonia, Conn. This new electric boat was launched last week by Mr. Geo. T. Grower, of the Ansonia Brass & Copper Company. There is nothing unusual in the appearance of the boat except a long box-like structure extending the length of the boat over the keel. When the party was seated and Mr. Grower pressed a little lever, the boat started up the river at a good rate of speed although stemming a strong current, as the tide was running out. The vessel was run up to within a short distance of the dam against the current, a feat which would be impossible against the current in an ordinary row or sail boat.

The boat is an ordinary sized row boat 14 feet in length and four feet wide. The structure in the center contains the storage battery, of 50 cells, which furnish the power for the motor. The electricity for the batteries is taken from the Star Pin Company's dynamo, conducted by wires from the factory to the boat and requires eight hours to charge them.

A Perret motor is used and is stowed away under the seat in the stern where it is entirely out of the way. A small cog wheel at the end of the armature turns a larger cog wheel at the end of a shaft. This runs slantingly through the stern of the boat to the screw. The smaller cog makes 1,800 revolutions per minute, which is reduced by the larger wheel to 240 revolutions, the number made by the screw. This gives the boat a speed of about five miles an hour. The boat being a very wide one this is very good speed. With a narrow built boat the speed could be doubled with the same power. The advantages derived from this motive power over any other are great. There is no puffing little engine as in a steam yacht, heating up the little craft to an uncomfortable degree, requiring the constant attention of the engineer in shoveling coal and watching the steam gauge and rendering the boat top heavy by the weight of the boiler. The batteries are directly over the keel, taking up no room which is needed as their wood casing makes good seats, and as they weigh nearly 500 pounds they make excellent ballasts.

Many persons watched the craft from the shore and they had a good reason to be puzzled.

The picture of a number of persons in a boat, no one being occupied except the pilot, with no oars, sails or even a smoke stack visible and with the boat rushing through the water at a high rate of speed, would naturally excite the curiosity of the uninitiated.

The Perret motor, which is used, is a light one weighing but 90 pounds, but is of one horse-power and is of 100 volts E. M. F. It is very simply managed and can be reversed quickly and stopped instantly. It is built so that in starting the power is applied gradually to the motor thus obviating the danger of burning out the armature.

The Alioth Dynamo.

Messrs. Alioth & Co., of Bâle, show a large collection of their "Helvetia" dynamos at the Paris Exposition. Some alterations and improvements in details have recently been made by the firm in these machines, and the type exhibited is that brought out at the beginning of the present year. The following description we get from *Industries:* "The machines are of the four-pole type, with radial magnets and external yoke ring, and the armature is of the drum pattern, the coils embracing about a quarter of the circumference. Fig. 2 shows the armature of a 70 k. w. machine intended for incandescent lights, and Fig. 1 shows the whole machine complete.

"The coupling up of the coils on the armature is varied according to the purpose for which the machines are intended. The armature coils are of saddle shape; they are wound upon special formers, and are so arranged that single coils can be taken out and replaced without disturbing the rest of the winding, which is a great advantage in case repairs become necessary. The general appearance of the machine is substantial and pleasing as will be seen from our illustration. The brushes are set 90° apart, and are of very simple construction. Th brush holders are attached to a gun-metal ring, which can be shifted by means of a hand-wheel, rack and pinion.

"The machines are made in 16 different sizes, ranging from .4 to 70 kilo-watts. Those intended for arc lighting or power transmission are series wound, and regulation for constant current with a varying number of arc lamps is obtained by shifting the brushes. The following table gives the leading particulars of some of the machines when wound for incandescent lighting, the terminal pressure being in all cases 110 volts. The induction within the core of the armature, which consists of thin iron dics, is in all cases 14,000 :—

Output in kilo-w'ts.	2.2	6.6	13.2	26.4	53	70
Speed	1100	830	670	530	400	350
Weight (cwt.)	6.6	15.5	28.6	56	120	170
W'ht per h.p.(cwt).	2.2	1.7	1.6	1.6	1.7	1.8
Length over all	2' 8"	3' 7"	4' 5"	5' 6"	7' 1"	8' 2"
Height	1' 9"	2' 4"	2' 10"	3' 6"	4' 6"	5' 4"
Width	1' 7"	2' 2"	2' 9"	3' 6"	4' 6"	5' 4"

"Special attention has been paid to the ventilation of the armatures. The discs are arranged in groups of six, a space of ⅛in. being left between adjacent groups, so that six may pass through the core. The armature conductors are also arranged with spaces between them, so that the external surface of the armature contains numerous small holes, all communicating with the internal space surrounding the shaft. As will be seen from the illustration of the armature, the end is open, so as to give access to the air, which by the action of centrifugal force is drawn into the interior space, and escapes through the ventilating holes already mentioned, so that the comparatively high current density of 3,000 amperes per square inch can be obtained.

"Some of the machines are employed in feeding a series of arc lamps used for lighting a portion of the machinery hall at the Exposition. These lamps are of the clockwork type, the positive and negative carbon rods being provided with racks, which engage on opposite sides of the pinion, so that they move in opposite directions by equal amounts. A novel feature in this lamp is a magnetic brake to steady the feed motion On the shaft of the pinion which controls the movement of the carbon rods is a large spur wheel, engaging with a second pinion, to the axle of which is fastened a metal disc. The latter revolves between the poles of an electro-magnet energized by the main current. The feed is started by the release of a pawl engaging with the teeth of the large spur wheel, but the latter can only turn very slowly, on account of the eddy currents generated in the metal of the brake disc, and a very delicate feed motion is thus obtained."

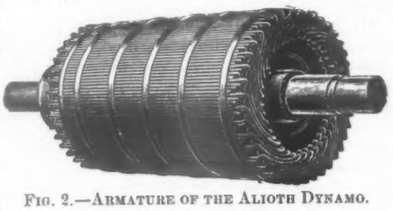


Fig. 2.—Armature of the Alioth Dynamo.

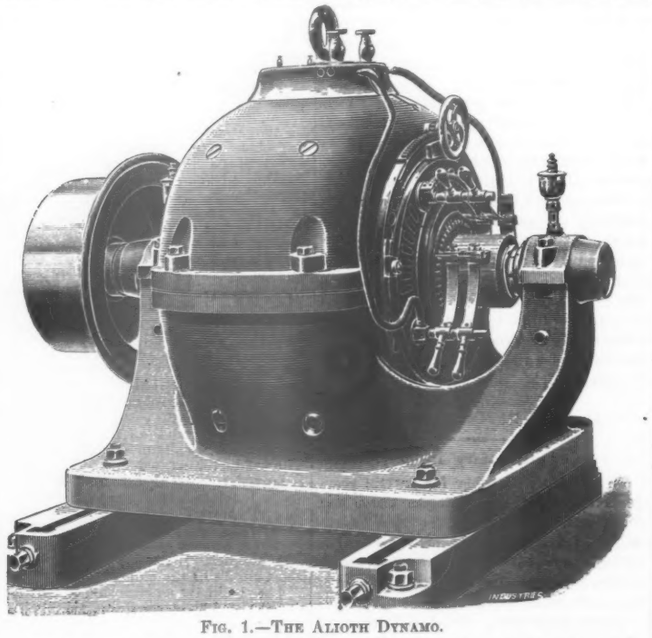


Fig. 1.—The Alioth Dynamo.

Consolidated Electric Light Company.

The annual meeting of the Consolidated Electric Light Company was held at the office of the company, 32 Nassau street, N. Y., on the 18th day of September, 1889.

The report of the treasurer of the company for the current year showed :

Capital stock outstanding		$2,404,400
Debenture bonds outstanding, Oct. 1, '88, beginning of current year.		
Due, October 1, 1892	$125,000	
Due, January 1, 1895	200,000	$325,000

On October 1, 1888, the company leased its real and personal estate, in New York and Pittsburgh, to the Westinghouse Electric Company, for $150,000 per annum, being six per cent. upon its capital stock, and for one cent royalty upon each and every incandescent electric lamp manufactured by the lessee or any of its associates.

Under this lease the royalties on incandescent electric lamps, sold between October 1, 1888, and September 1, 1889, has increased 45 per cent,

By the terms of the lease to the Westinghouse Electric Company, the Consolidated Electric Light Company is required to set aside, as a sinking fund, $58,400 per annum, equal to 18 per cent. per annum of its issue of debenture bonds, to be applied to the purchase of said bonds, or the payment of the same at maturity ; and is also required to pay to the stockholders a dividend of at least four per cent. per annum, payable quarterly. The report shows that after paying the dividends and all expenses of the company, including interest on its debenture bonds, the amount carried to the sinking fund has been $90,624.37 instead of $58,400, and has reduced the principal of said bonds about 31 per cent. instead of 18 per cent.

The total receipts were		$172,760 28
Disbursements were :		
Applied to sinking fund for anticipating payment of debenture bonds of the Co.	90,624 37	
Expenses, including interest on debenture bonds	25,373 81	
Quarterly dividends for six months, ending July 1st, 1889	47,848 00	

The rental from the Westinghouse Electric Company is paid quarterly : and out of the rental for the quarter ending September 30th, 1889, a quarterly dividend of one per centum was declared on the stock of the Company, payable October 1st, 1889.

The report further shows that the management of the property by the Westinghouse Electric Company, the lessee, had greatly enhanced its value, and the operations for the year demonstrated that its net earnings were sufficient, irrespective of the guarantee of the lessee, to pay the rental, the royalty, and all charges.

The president congratulated the stockholders on the condition of the company, and stated that it would warrant an increase of dividends above four per centum, but that the interests of the stockholders would be enchanced by the further application of the surplus, for the present, to the anticipation of the payment of the debenture bonds of the company.

A resolution approving the action of the management, and tendering them the thanks of the stockholders, was unanimously adopted.

The board of trustees elected at the stockholders meeting were : George Westinghouse, Jr., Pittsburgh, Pa. ; Hugh R. Garden, New York ; Amos Broadnax, New York ; Henry C. Davis, New York ; Jacob Hays, New York ; Thomas Bakewell Kerr, Pittsburgh, Pa. ; George H. Lewars, New Jersey.

The following officers of the company were elected by the board of trustees for the ensuing year : Hugh R. Garden, president ; Jacob Hays, vice-president ; George H. Lewars, secretary and treasurer.

Electric Lighting in England.

(From our Regular Correspondent.)

The prospect of the early more effective lighting of the metropolis by electricity has been received with the greatest commendation by the voice of the public as represented through the general press. The immensity of its trade necessitates working by night as well as by day, and yet London, the largest and most undenisably the chief capital in the world, is stated to be now or to have been very lately the worst lighted capital in Europe, with the mere exception of Madrid, and it is indeed a most doubtful compliment to have to mention Londoners as on a level with the Spaniards in any industrial enterprise. Even in the most favorable weather the darkness of London streets has been a constant disgrace, and burglars, thieves and brawlers have been permitted and helped in the carrying on of their respective so-called professions. At last, however, a change is coming over the scene and the electric light will soon be generally in use on the whole route from the Strand to the Law Courts, and from Charing Cross Road to Farrington street, and will be a great comfort as well as add to public convenience in the gloom of the English winter, and in the thick fogs and the dark dismal days with which it is so generally accompanied.

When the question of general electric lighting was first brought up, it was greatly feared that there would be constant disturbance to public thoroughfares in the case of laying on of new or failure of old supplies, but such arrangements are being made as will entirely obviate all such difficulties. From the channels of the main current branches will lead off to the pavements. A plate stamped with the company's name will cover the branch ends of cables and from such points the wires will be carried below the pavement, so that in the event of a supply being required to be laid on the necessary plate only will have to be raised and it can then be made most expeditiously and with little trouble. There are also to be numerous boxes made for the purpose of testing in cases of failure or damage and through which the cable can be drawn up, examined, if necessary repaired, and then replaced without any pulling up of the pavement or troublesome breaking up of the roadways. Altogether, in regard to health, comfort and

commercial advantages, the lighting by electricity which promises to become general in the near future affords a prospect of only unmixed good to the community at large.

HOW THE UNDERGROUND WIRES ARE RUN.

The electric lighting companies are still extremely busy in the metropolis in the laying down of their mains, and are making excellent progress. The London Electric Supply Corporation, whose mains run along the South Eastern Railway from Deptford to Charing Cross, will very shortly be able to take over a large portion of the work carried out by the Grosvenor Gallery machines. Messrs. Gatti run their cables in Callender Webber conduits, protecting the asphalt casings by thin sheets of iron. The St. James and Pall Mall Company have bare copper conductors running on china insulators and fixed in iron troughs. The Metropolitan Company supply from their Sardinia street station in six-inch iron pipes, positives and negatives together.

ALMOST UNANIMOUS FOR THE ELECTRIC LIGHT.

At the monthly meeting of the Dublin corporation, on Monday last, Mr. Robinson, C. E., moved the adoption of the electric lighting committee's report recommending that £50,000 should be borrowed to carry out the work. The Lord Mayor having stated that the repayment of the loan, both principal and interest, would only mean a penny in the pound to the ratepayers, while the rate for gas at present was five pence in the pound, and that the ratepayers were willing to run any risk, the motion was adopted by 38 to 3 votes.

THE CASTLE MONA PLANT.

The Manchester Edison-Swan Company, Limited, have recently completed and most satisfactorily an important installation at the popular pleasure resort, Castle Mona, at Douglas, Isle of Man. The syndicate, who last year purchased Castle Mona hotel and grounds, have added a large pavilion for dancing, and the installation is a mixed one of arc and incandescent lights, part of each being in the grounds as well as in the pavilion. The arrangements have been carried out by Mr. J. R. Williamson, M. I. E. E., managing director of the Manchester Edison-Swan Company. I am indebted for particulars to the *Electrical Review* of London. There are in all 20 arc lamps of 3,000 candle-power each, and 500 incandescent 16 candle-power lamps.

In the engine room, which has been specially erected, are placed two 25 horse-power compound Robey engines with locomotive multi tubular boilers which drive, by means of counter shafting, two No. 5 compound wound Manchester dynamos for incandescent lighting, each with an output of 100 volts and capable of running 300 volts at a speed of 800 revolutions per minute; and two No. 5 series-wound Manchester dynamos, each capable of an output of 600 volts and 20 amperes at a speed of 1,100 revolutions per minute.

The switchboard arrangement is very complete, there being double pole switches on each circuit, and the connections are such that any change of circuit or dynamo or any combination can be effectively carried out. CHARLES FFRENCH.

London, Eng., Sept. 18, '89.

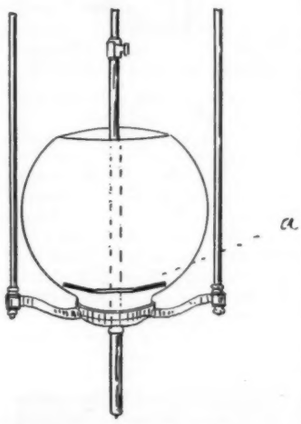
Globe Protector for Arc Lamps.

One of the most expensive items in a small way in arc electric lighting is that arising from the breakage of globes. The heat of the arc is intense, gradually coming nearer to the bottom of the globe as the night wanes, until the entire globe has become quite heated, and expanding unequally is quite liable to breakage, or to a sudden cooling from snow or rain which may result equally disastrously. Then, too, there is the constant dropping of the molten copper, and particles of hot carbon, to aid in the work of destruction. On a large plant such a cause in the course of a short time makes very uncomfortable inroads on the cash credit side of a set of books.

To prevent this wholesale breakage, Mr. G. C. Asmus, of Chicago, has invented and patented a protector, which is illustrated herewith, and which is extremely simple and efficient. A disc of mica or other similar transparent material is made up of sections as shown in Fig. 2, these sections being held together by suitable frame work. The action of the protector is two-fold. It not only keeps the heated particles of carbon or metals from the carbons from contact with the globe, but protects the latter by the air space beneath the mica disc, as seen at *a*, Fig. 1. And again, in those forms of lamps where holes are left in the bottom for ventilation, falling sparks are arrested by the disc, which prevents their falling through the bottom and doing possible mischief in the line of conflagration, and while the ventilation is left intact, the sudden influx of wind cannot materially affect the lamp because of the current being deflected by the disc.

The Electrical Supply Company, of Chicago, at 171 Randolph street, has the sole control of the Asmus globe protector, where further information may be obtained.

Fig 1.



GLOBE PROTECTOR FOR ARC LAMPS

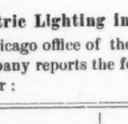


Fig 2

Electric Lighting in the West.

The Chicago office of the Thomson-Houston Company reports the following sales for September:

	Arc.	Direct Incandescent	Alternating.
Verdi, Cal.	18		
Santa Cruz, Cal.			650
Springfield, Ohio.	50		
Sioux City, Iowa.	85		
Peoria, Ill.	405		1,300
Fremont, Ohio	50		
Grand Rapids, Mich.	50		
Mitchellville, Iowa.		150	
Belle Plain, Iowa.	30		
So. Manistique, Mich.		75	
Watertown, Wis.	50		650
Chicago	62	500	
Bay City, Mich.		150	
Milwaukee, Wis.		150	
Fort Scott, Kan.	70		
St. Louis, Mo.	6	300	
Mason City, Iowa.	35	300	
Hope, Ark.			300
Para, Ill.			650
Oak Park, Ill.			1,950
So. Omaha, Neb.			650
Austin, Tex.		100	
Sheboygan, Wis.		150	
Total	901	1,875	6,150

This is a very gratifying month's work and is strong evidence of the progress of the West, as well as of the energy of the Chicago office of the Thomson-Houston Company. It will be noticed that the number of lamps of the alternating system is over three times as great as the number of direct incandescents.

—— The Scranton coal mines are to be illuminated with electric lights, and electricity will supply the motive power for drawing the cars in them, thus relieving the overworked mules.

—— The Rockville Gas Light Company, of Rockville, Conn., has placed a contract with the Thomson-Houston Electric Company for a 110 arc light plant. Of this number, 74 will be for public lighting, and the remainder for commercial purposes. The Wright Electrical Engineering Company will do all the line construction work, which will include about 500 poles and 21 miles of wire. Work will begin at once, and the plant is to be in operation by November 1st.

—— The demand for electric lighting through the city of Lowell, Mass., and suburbs is so great that the Middlesex Electric Light Company has ordered of the Thomson-Houston Electric Company an additional 1,000-light alternating incandescent dynamo and one 50-light arc dynamo. The company has also placed an order with J. H. Houghton, of Boston, for a 200 horse-power engine to be put in immediately. The two engines in use at present are of 300 and 250 horse-power respectively.

—— The Central Glass Works will probably soon enlarge its capacity, devoting the increased facilities to the manufacture of electrical glass. Experiments are now being made on an oblong glass jar for storage batteries. It is said to be a success, and is believed to be the coming storage jar. The company has also recently commenced the manufacture on a large scale of globes for incandescent lights. It has long made globes and shades for arc lights. All the electric light appliance factories are said to be behind in their orders through scarcity of glass.—*Wheeling Graphic.*

—— The city of Williamsport, Pa., that suffered so seriously by the flood of June 1, has contracted with the Westinghouse Electric Company for 170 arc lamps (Waterhouse system), for five years lease, to be put in operation December 1. The station will be 72x110 feet, contain five 50 arc and one 1,500 incandescent dynamos, three 80 horse-power and one 150 horse-power Westinghouse engines, Babcox & Wilcox boilers. The plant, it is claimed, will be first class in every particular. Foundations are already completed, brick walls will be up and under roof November 1, when machinery will be placed. The Westinghouse Electric Company, it is said, will make this a model station.

—— An organization to be known as the Superior Water, Light and Fuel Company has been organized, with M. Meggins, of Duluth, Messrs. Wilder & Merriam, of St. Paul, and F. A. Ross, of Superior, as incorporators. It absorbs the Superior & Duluth Electric Company, the Superior Water Works Company and the Superior Light and Fuel Company, and has a capital stock of $1,000,000, every dollar of which is paid in. It will furnish electric power for the new street railway, and will be prepared to furnish electric motive power to an unlimited number of manufacturing establishments. By November 1st every department of the company will be in working order. One of the things promised by them is the bringing of water from the lake during the coming year.

—— Harry A. Kinney, electrical engineer, of Omaha, Neb., has just completed a very complete electric light plant for Tarkio, Mo The dynamos, two in number, are Edison No. 6, and operated in series by the Westinghouse engine. The city is wired on the three-wire plan, and lamps have been placed in nearly all of the business houses, residences, churches, and also in the Tarkio College, which alone has nearly 200. The streets are lighted by lamps suspended from cross wires just over the center of street crossings. The Pumpelly storage battery is used in connection with the dynamos, and furnishes lamps with electrical energy when dynamos are not running, from midnight till about 5 o'clock the next afternoon. The plant is running very successfully and giving excellent satisfaction thus far.

ELECTRIC LIGHT NEWS

—— The Thomson-Houston Company has closed a contract for a 2,500 h. p. lighting plant at Omaha, Neb.

—— The electric light system at Bridgewater, Mass., will be in operation by Nov. 1. Twenty-five arc lights will be used, and 450 incandescent lights have been contracted for.

—— The Salem Electric Lighting Company, of Salem, Mass., has commenced running separate wires from Salem to Peabody, for the purpose of furnishing incandescent lights.

—— The Duluth Electric Light and Power Company, Duluth, Minn., has been given the contract for lighting the Temple Opera. About 700 lights will be used, ranging from 10 to 20 candle-power. All wiring is now done.

—— The Perkins Electric Lamp Company, of Manchester, Conn., have again decided to double their production, so as to bring up their capacity to 2,000 lamps a day. At present the company employ 50 hands. In a short time the number of employés will be increased to 100.

—— Gov. W. R. Merriam, A. H. Wilder, J. A. Barker, F. B. Kellogg, R. C. Elliott and John Mather, of St. Paul, will expend $40,000 this fall in improvements on the water works and electric light plants at West Superior, Wis., which will make a total investment of $500,000.

—— It is stated that a millionaire who died recently at Vienna had such an antipathy to darkness that he left instructions in his will for the illumination of his tomb. An electric light is to be kept burning in the vault during a whole year, and even the interior of the coffin is to be electrically lighted.

—— The Thomson-Houston Company have 600 arc lights in the city of Cleveland, 5,000 direct incandescent and 2,500 incandescent lamps, alternating system. They have recently increased their works there by the addition of a new Corliss engine manufactured by C. & G. Cooper, Mt. Vernon, Ohio.

—— The Hartford Light and Power Company, Hartford, Conn., are erecting a new building at their works in that city in order to increase their capacity. At present the aggregate horse-power in use at the works nights is 1,200, keeping the great plant established by the Hartford Steam Heating Company busy all the time.

—— The Brush Electric Company, of Cleveland, is very busy with electrical work and is running until 8 P. M. regularly, and some departments until midnight. An experimental electric railway track has been built through and around the 10 acres of works and this branch of electrical work is receiving a most thorough test. The Brush Company recently purchased the Short system of electric railways.

—— The Edison Illuminating Company, of Topeka, Kan., has secured the contract for lighting the east and west wings of the State house with 600 incandescent lamps. The Kansas Electric Company, of Topeka, contracted for the wiring. Geo. J. Bayless, general superintendent of the company, is an experinced telephone manager and is very naturally making quite a success of this branch of electrical work.

—— The Municipal Council of Sydney, New South Wales, invites applications for the right to establish a system of electric lighting and power in that city. Upon a satisfactory system being submitted and approved, the council will be prepared to enter into an agreement for the lighting of the whole or a section of the city. Full particulars may be obtained at the offices of the agent-general for New South Wales, 9 Victoria street, London, S. W.

KINDRED INTERESTS

The Pond Engineering Company will furnish the city of Seward, Neb., with a Holly duplex pump of 100,000 gallons capacity, together with the necessary boiler, heater, etc., for their system of waterworks. The same company are supplying the St. Louis Stamping Works with a boiler and engine.

E. E. Garvin & Co., New York, have just issued a special list of new and second hand machinery, the greater part of which came to them through trade. The list includes machinery needed by electrical factories and is an opportunity to purchase cheaply. Engine lathes, hand lathes, upright drills, milling machines, sharpers, iron planers, screw machines, bolt cutters, emery grinders, etc., are included in this list.

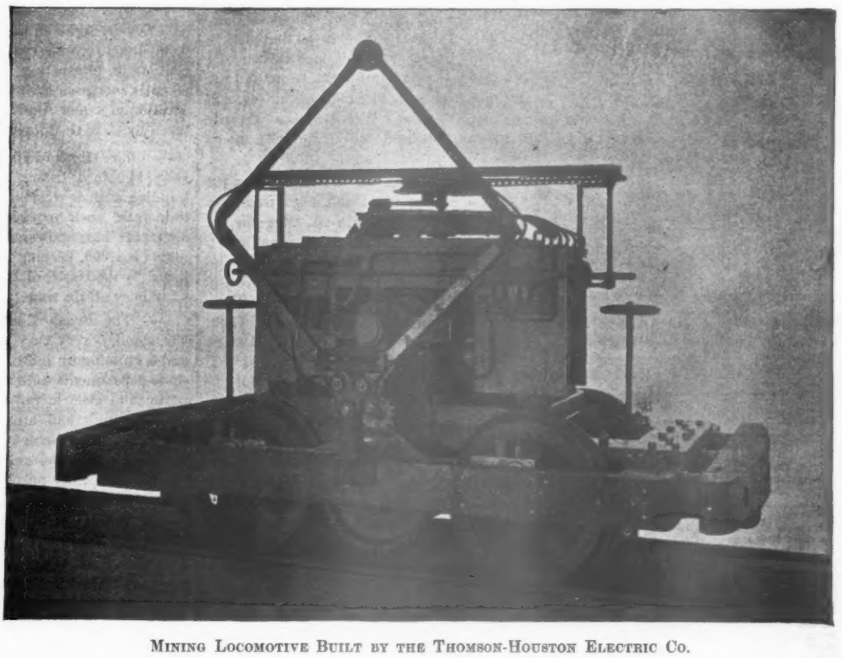
Buckeye Engine Company.—This progressive engine company has been compelled to enlarge its manufacturing facilities at Salem, Ohio, where its works are located. An addition 60 feet long is being finished and an increased force will soon be at work. The Buckeye Company have in use over 2,500 automatic cut off engines and build them in sizes of 25 to 1,000 horse-power. The company will send out free by mail illustrated circulars giving various important data relating to practical steam engine construction and performance.

The growth of the Westinghouse Machine Company's business still continues. During the past five years its buildings have been extended from the square in Pittsburgh originally occupied by the Westinghouse Air Brake Company until they now cover two and one-half blocks of contiguous property. Machinery has been added (much of it quite recently) until now the limit has been reached and there is no space for more. No additional property is available in the vicinity, and to keep pace with the constant growth of the business the company is engaged in erecting a three-story warehouse for finished engines, repairs, etc., which will be provided with steam hoists, overhead cranes and all known appliances for the quick and economical handling of heavy weights. In addition to this, the company is now taking on a complete new force of workmen, so that the establishment will henceforth be operated continuously day and night.

John Stephenson Co.—The important work of constructing cars for electric railways has become a prominent feature of this well-known and long-established car building company. A recent visit by a REVIEW representative to their extensive works on 27th street, New York, found them shipping a number of these cars to go to the different electric railways in all parts of the States. A consignment of very handsome cars were being marked for Omaha. Although the company has secured a very extensive business, it has not found the work without some drawbacks, as the constant change and improvement which is going on in the electric field naturally affects the manufacture of cars for electrical railways, and patterns that will do one month will very often be changed the next. But it is this constant change which is a sure indication of the progressiveness and activity of the electrical industry, particularly in the electric railway branch, and the Stephenson Company is acting wisely in following up the work with the extensive resources at its command.

Electricity in Mining.

That the electric current can be easily adapted to mining and engineering operations is a fact which is abundantly attested by mines in which it has already come into general use for both lighting and transmission of power. The contrast between the wire rope, compressed air and other methods, with electrical transmission of power, cannot fail to be in favor of the latter system. Existing water powers miles away from the mines may be used, and electric motors employed for hoisting, haulage, pumping, ventilating, and many other purposes with greater ease and economy than could possibly be accomplished by any other method. The Thomson-Houston Electric Company has just completed a mining locomotive for the Hillside Coal Company, Scranton, Pa., which is shown in the accompanying illustration. The machine embodies new features in motor construction and in general design, and under practical test has shown that it is particularly adapted to the nature of the work required of it. The locomotive is made for operation on a three foot gauge, is 9 feet 7 inches in length over all, width 5 feet 3 inches, and height 5 feet 6 inches. Although the weight is 10,500 lbs., there is not a pound of it which is not utilized in the construction of the machine, and the tests for traction which have been made have given the most excellent results. The speed is six miles an hour under full load.



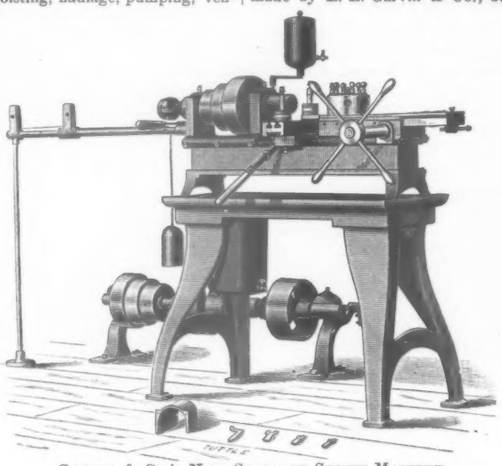
MINING LOCOMOTIVE BUILT BY THE THOMSON-HOUSTON ELECTRIC CO.

The motor used is the type "G" railway motor, 40 h. p., embodying designs and inventions of Mr. Chas. J. Van Depoele. Its motion is transmitted to the wheels by gears and connecting rods. On the top of the machine is placed a rheostat controlled by the wheel shown at each end, and on the side is placed a reversing switch which can be operated in the same way from either end.

One of the distinctive features is the trolley arm which will operate with equal facility in either direction, and its method of construction permits a great variation in the height of the conductor. This is a very important and valuable feature, as in mining work the conductor is rarely maintained for any length at a constant height. The Thomson-Houston Electric Company has already made in mining operations many applications of its electrical apparatus, which has been found to possess the same characteristics of excellence shown in its well known lighting systems.

No. 2 Screw Machine with Pilot Feed.

The engraving represents a screw machine made by E. E. Garvin & Co., New York.



GARVIN & CO.'S NEW STYLE OF SCREW MACHINE.

This size machine is made with and without wire feed, also pilot or lever feed.

The machine is adapted for making screws ¼ to ⅝ inches diameter. In a machine of this kind studs of two or more diameters can be cut off from the rod, the ends rounded, threaded and head chamfered. Machine screws, washers, milled head screws, etc., can all be turned out with the utmost rapidity and accuracy and perfectly finished. Any length of screw can be made as the hole in turret goes directly through it. The turret has six holes for the reception of tools. The indexing mechanism for the turret is of hardened steel, and is strong and substantial. The locking pin is hardened and ground and works in an adjustable taper bushing and fits into hardened taper index sockets in the under side of the turret. The turret slide has a screw stop, and the bearing block is readily adjusted along the bed. The cross slide has two tool posts which are each provided with elevating collars which give a fine and parallel adjustment for tools. The slide is provided with a screw top. The spindle bearings are bronze cap boxes, and all sliding surfaces are scraped to a bearing. The cone is 8½ inches diameter and has three speeds for 2½-inch belt. There is a large reservoir in the bed of the machine into which the oil drains and is drawn off at the bottom. The machine weighs 950 lbs

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCT. 2, 1889.

411,772 Hotel electrical annunciator circuit; Chas. G. Armstrong, Englewood, Ill., assignor to New Haven Clock Company, New Haven, Conn.

411,783 Governor for electro-dynamic machines; Geo. F. Card, Covington, Ky., assignor to Card Manufacturing Company, Cincinnati, O.

411,786 Method of forming plates for secondary batteries. 411,787 Apparatus for forming secondary battery plates; Stanley C. C. Currie, Philadelphia, Pa., assignor to the United Electric Improvement Company, Gloucester City, N. J.

411,801 Wire holder and insulator; John R. Fletcher, Dayton, O.

411,805 Booth for signaling purposes; Thos. F. Gaynor, Louisville, Ky., assignor to the Gaynor Electric Company, same place.

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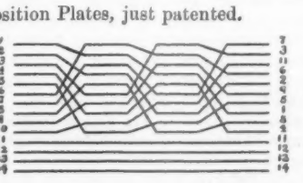

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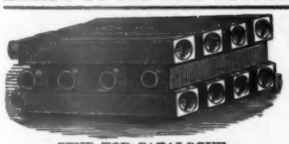

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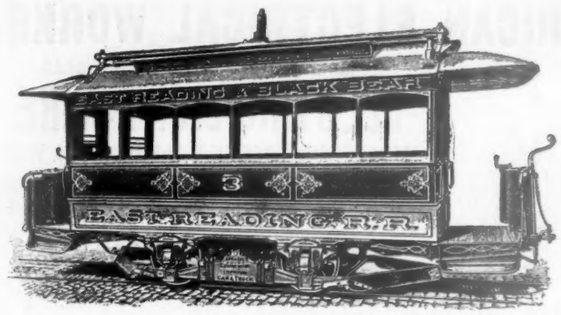

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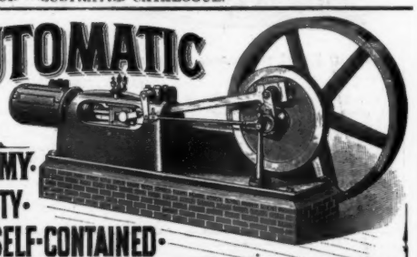

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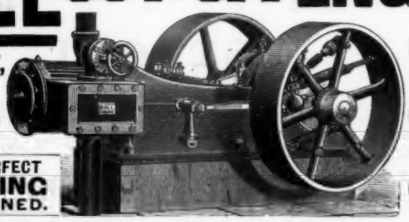

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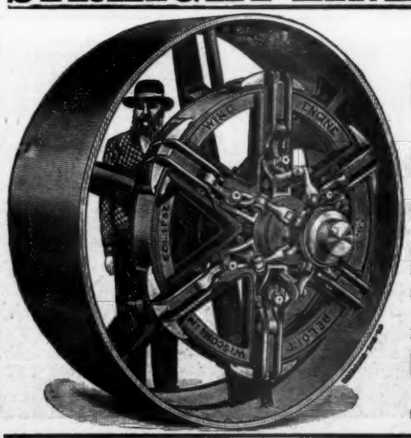

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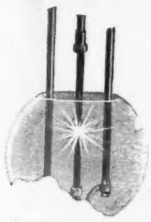

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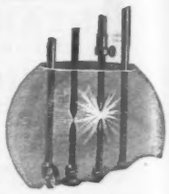

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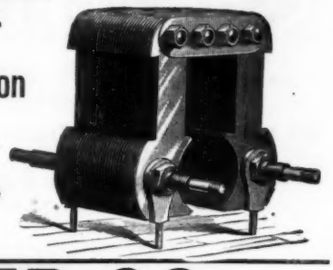

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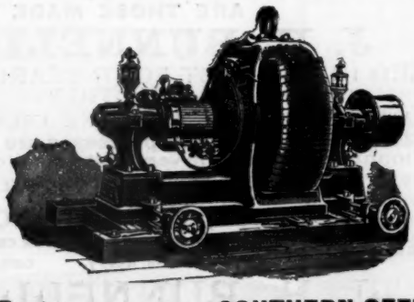

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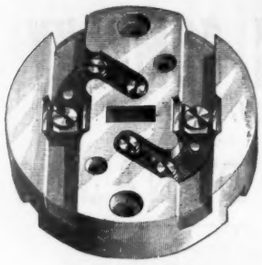

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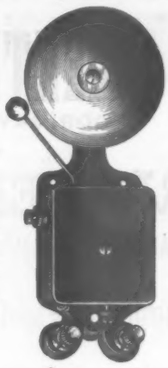

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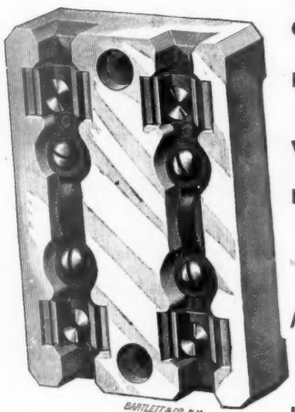

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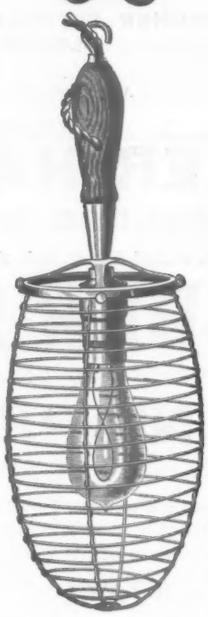

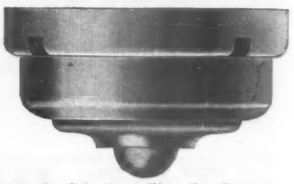

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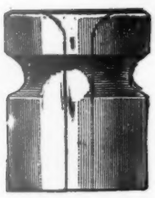

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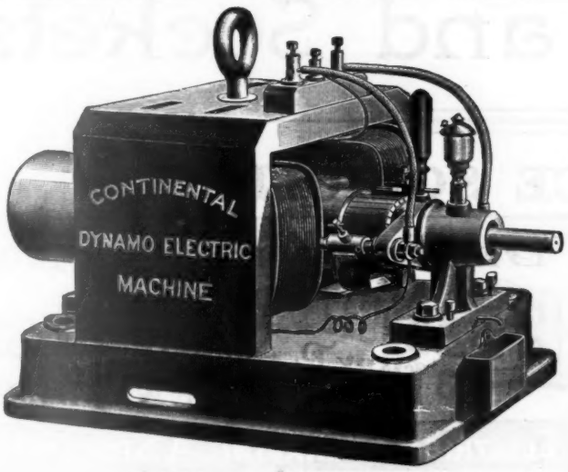

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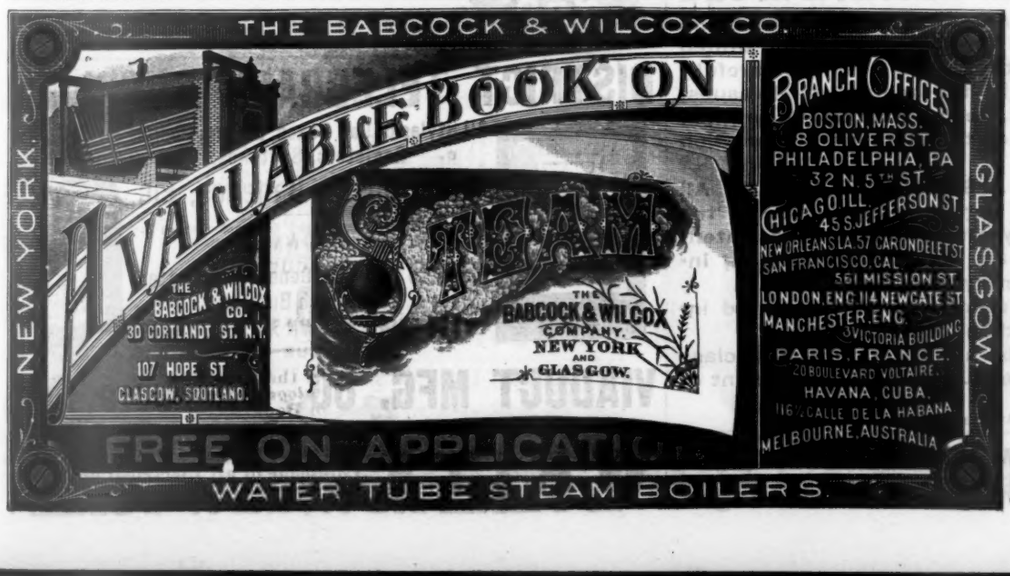
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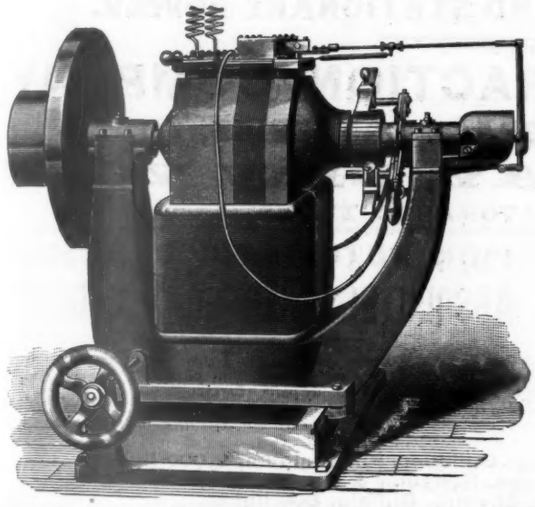

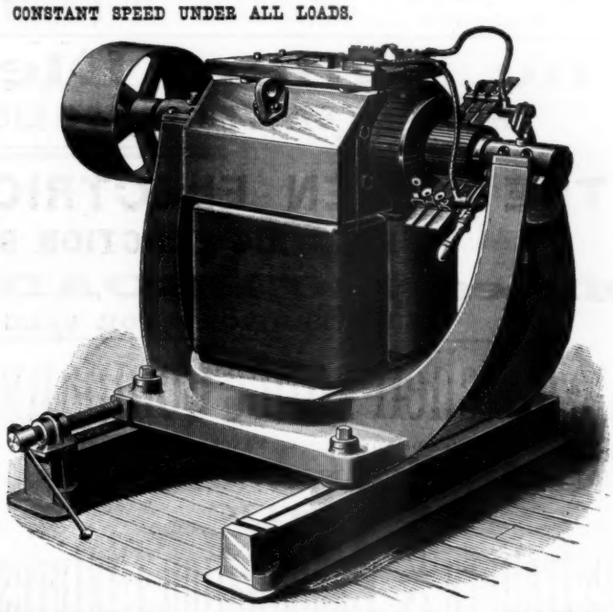

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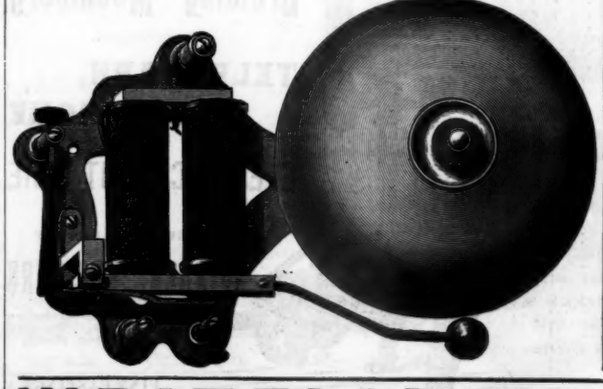

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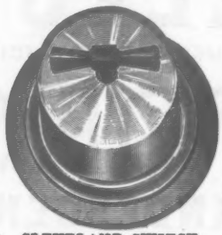
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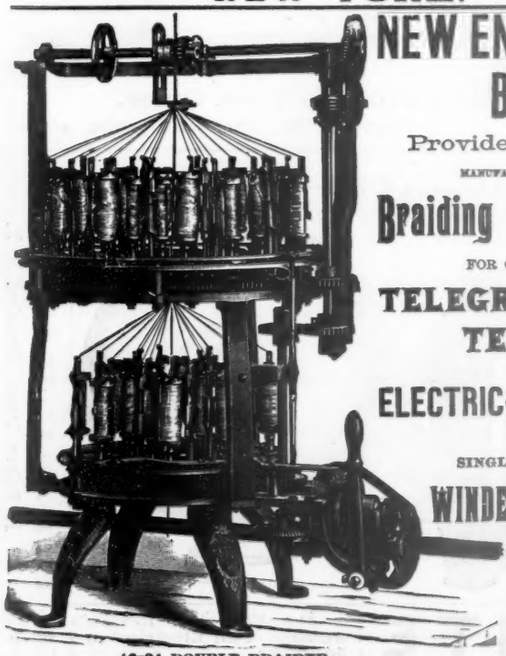
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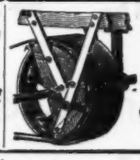

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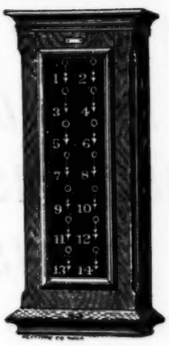

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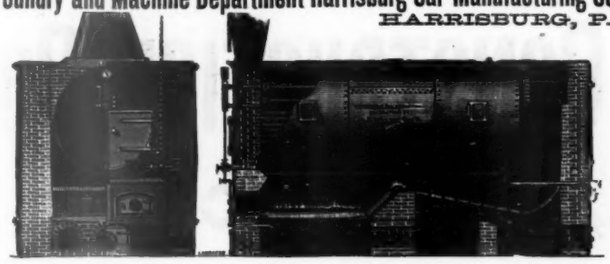

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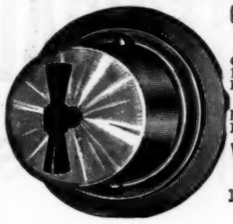

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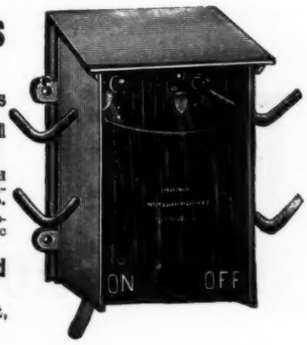

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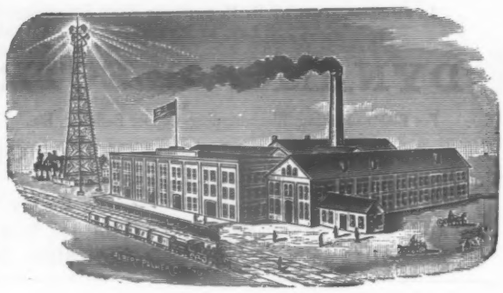

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